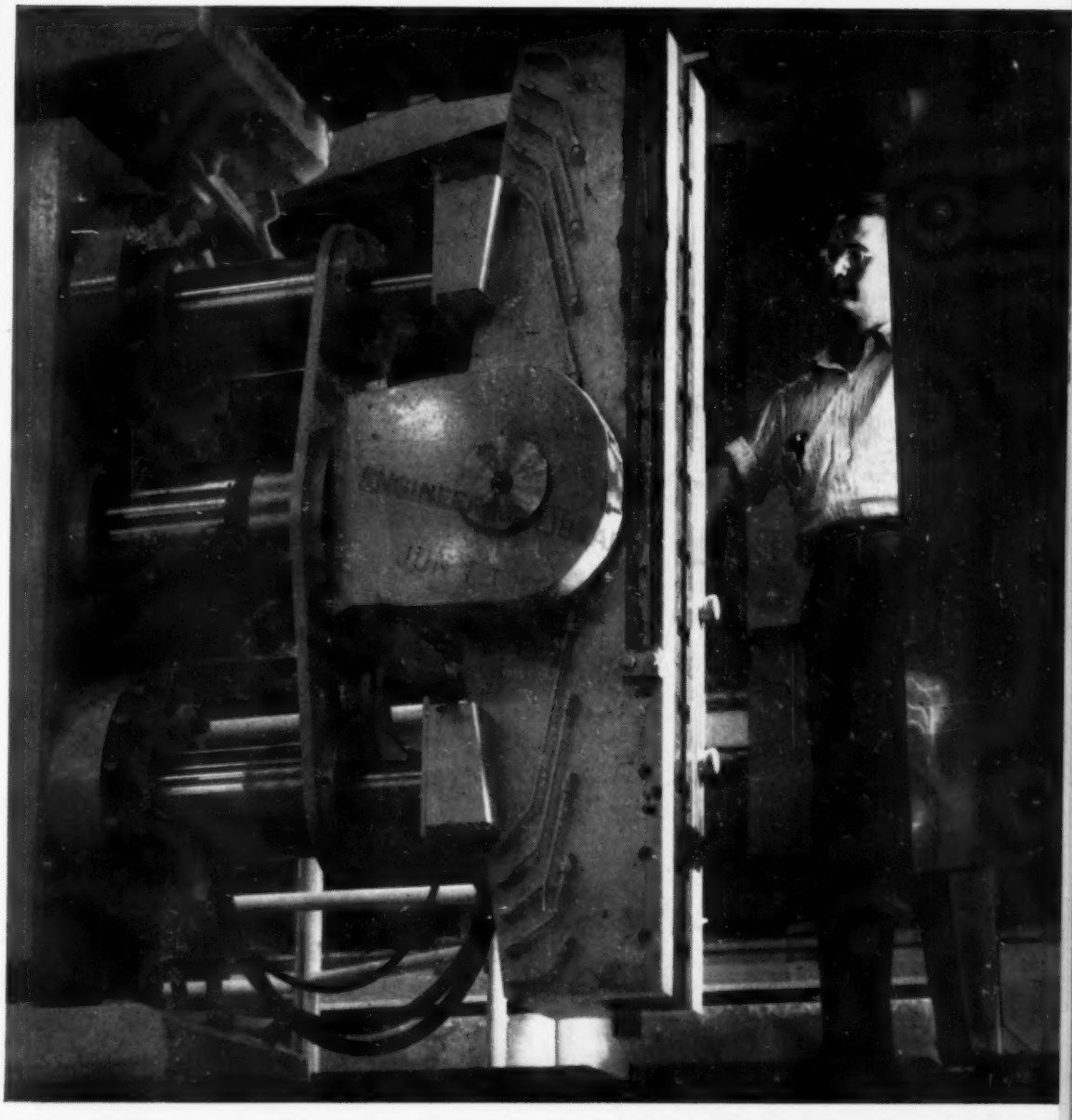
APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

JUNE, 1951

- HYDRAULIC CIRCUITS
- HYDRAULIC CONTROLS
- AIR CIRCUITS
- AIR CONTROLS
- ELECTRICAL AND ELECTRONIC CONTROLS



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A STRIP MILL MODERNIZES

LOGIC CALLED FOR HYDRAULICS ON THIS DOUBLE HEADED LATHE

OLD INDUSTRY — NEW METHODS

GIANT MACHINE MEETS DEFENSE SCHEDULES

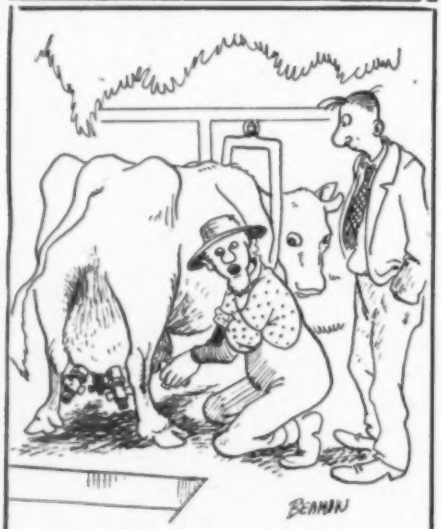
SIZE FLEXIBILITY ACHIEVED WITH PRESSURE LOADED EMBOSSING ROLLS

FAST SETUP — SHORT RUN EFFICIENCY

"Aeroquip Hose Lines are flexible enough to meet every requirement . . . except early delivery dates."

Aeroquip

FLEXIBLE HOSE LINES
DETACHABLE, REUSABLE FITTINGS
SELF-SEALING COUPLINGS
"BREAKAWAY" • HYDRAULISCOPE
AEROQUIP CORPORATION, JACKSON, MICH.



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Aeroquip

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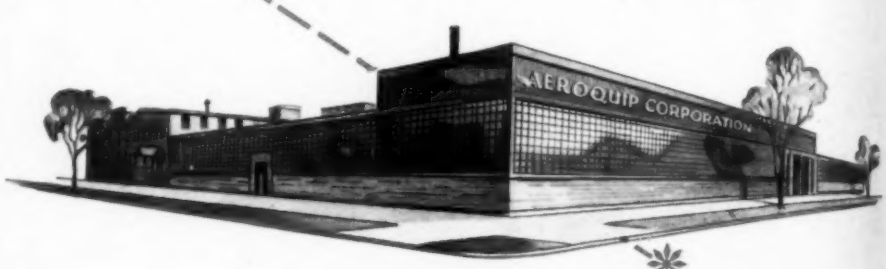

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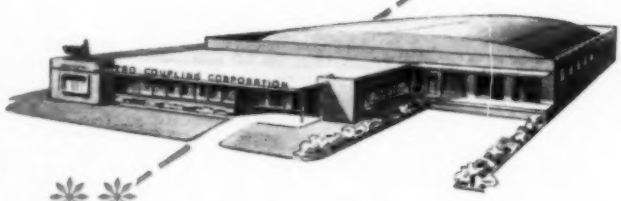

WAIT!

Today, when military and civilian demands for its products have doubled all previous records, Aeroquip announces the *completion* of a sizable expansion program. Two new structures and the acquisition of a new subsidiary have added more than 100,000 sq. ft. of highly productive space to Aeroquip's plant facilities.

It is not through mere chance that these important new additions are in operation *today*. More than a year ago the first warning signs that led to rearmament were recognized. Then, Aeroquip didn't wait for government prodding or financing, but with private capital and typical American initiative began a project which assures greatly increased production of vital Aeroquip products TODAY . . . *when they are of utmost importance.*

* *In Jackson, Michigan, there is a new 65,000 sq. ft. addition to the Aeroquip main plant.*

** *In Burbank, California, this modern 30,000 sq. ft. plant has just been completed.*

*** *Metalco, Inc., a new Aeroquip subsidiary, operates this plant in Cheboygan, Michigan.*

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JACKSON, MICHIGAN

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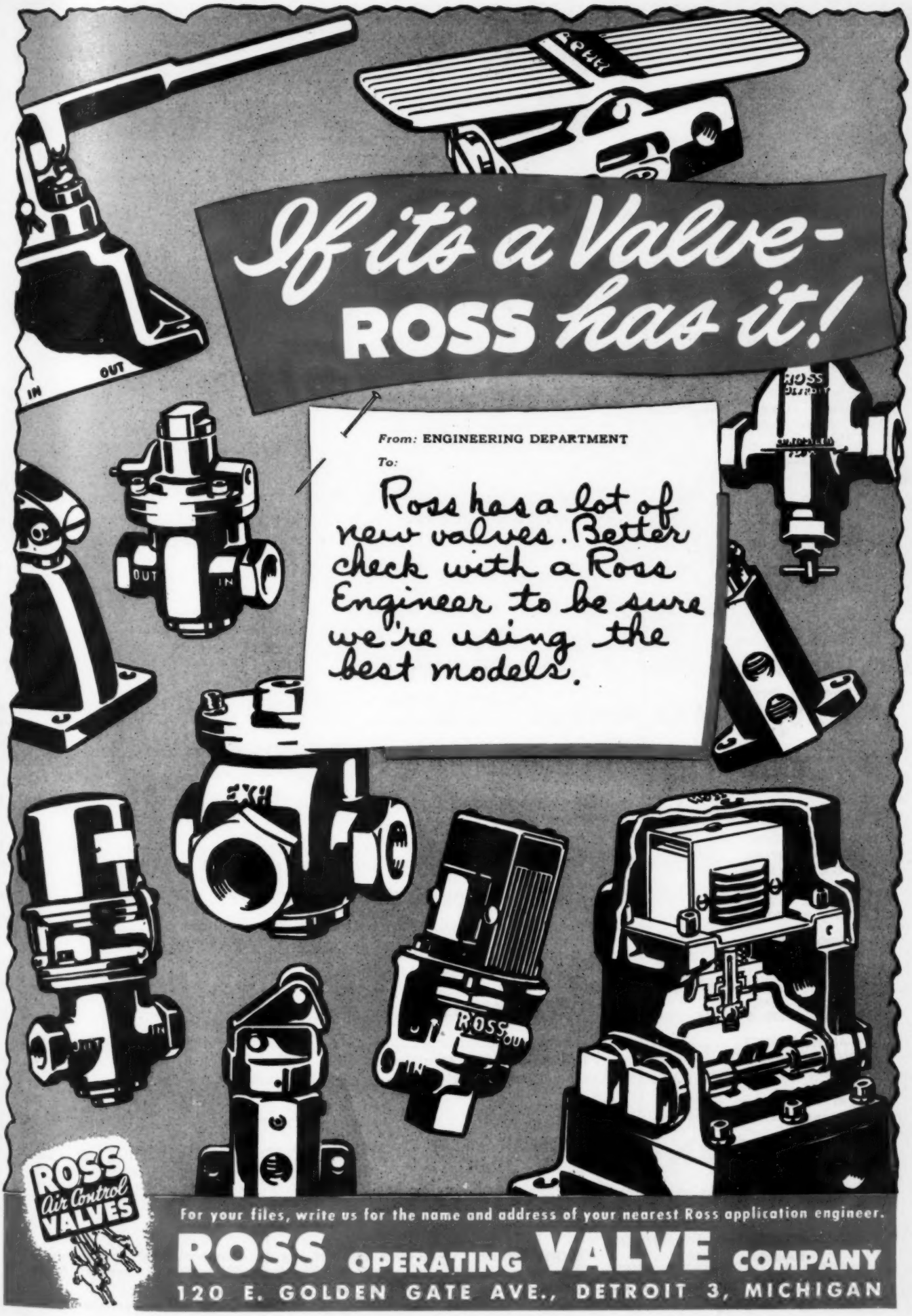
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ROSS has it!
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To:
Ross has a lot of new valves. Better check with a Ross Engineer to be sure we're using the best models.
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OUT
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applied HYDRAULICS

June, 1951 Vol. 4, No. 6

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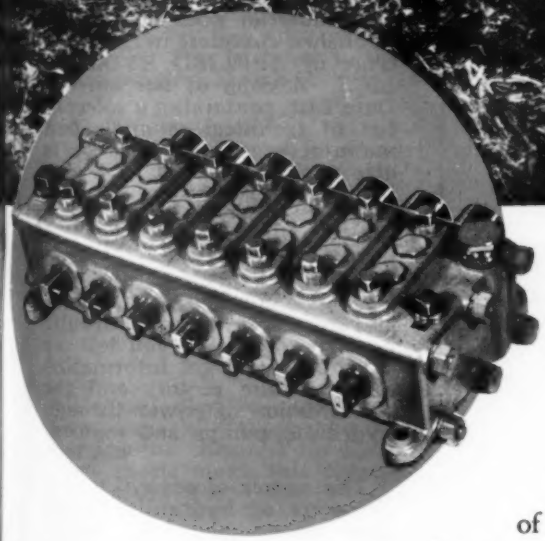
FRONT COVER: These large jaws will grip the aluminum sheet to stretch-wrap form an aircraft fuselage member. The hydraulic system is described in an article starting on page 52.

Photo Courtesy Douglas Aircraft Co.



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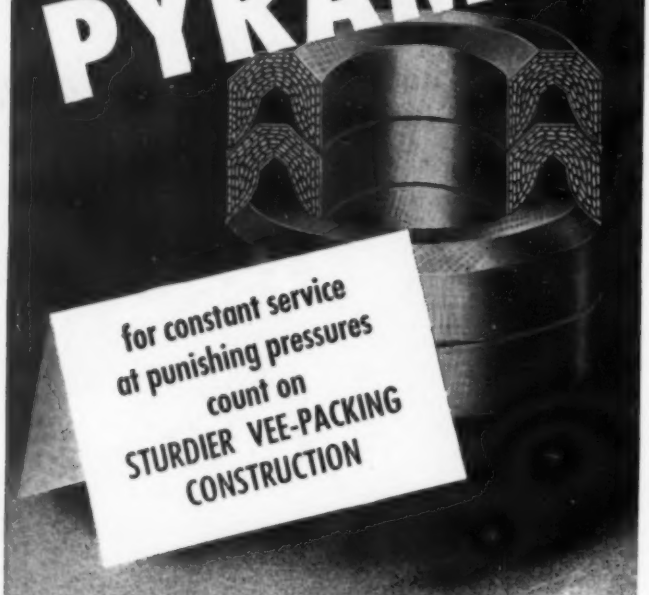

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No chance here for rupture or wear. Ordinarily, the walls of vee-packings are relatively thin—but the Pyramid's are extra thick, equipped with the strength and staying power to take prolonged service, without letup, in the *toughest* applications.

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And, there's another plus in this balanced design: two-thirds of the lateral packing surface is sealing surface—which means fewer rings per stuffing box.

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LETTERS to the Editor

We are starting on a program of hydraulic circuit design for automatic machinery and, in addition to manufacturers' catalogs of circuit components for incorporation into such design, we would appreciate information on J.I.C. Standards, circuit symbols and a list of books and technical literature containing representative machine tool hydraulic circuits or referring to design of hydraulic circuits for such application. We will appreciate your assistance.

J.C.B.

Your request for pertinent manufacturers' literature has been processed and this material should reach you promptly. The J.I.C. Pneumatic Standards for Industrial Equipment were published complete in the April issue of APPLIED HYDRAULICS. A copy of our current Data List, containing a selected list of technical manuals and manufacturers' design data is also enclosed. A new enlarged Data List, as noted elsewhere in this column, will be available shortly.

I run a machine shop in a farming community and build and repair a lot of hydraulic equipment. Could you tell me where I could get information on hydraulic motors and the transmission of power through hydraulic pumps and motors?

R.W.H.

The names of several manufacturers of hydraulic motors and pumps who have representatives close to you has been sent you. We believe the field representatives can be of considerable help to you.

In an Editor's Note to the April installment of the Beginner's Course in Basic Hydraulics statement was made regarding the range of pressures and viscosities at which Worthington rotary pumps are operated. The following letter from the Rotary Pump Division of that company corrects a statement at the end of the Note.

We have no objection to your statement that our rotary pump applications are below 500 psi, but in the other half of the statement, namely that our rotary pumps are never applied above 500 SSU, is a serious mis-statement. As we had written previously: "with nor-

(Continued on page 19)

Letters to the Editor

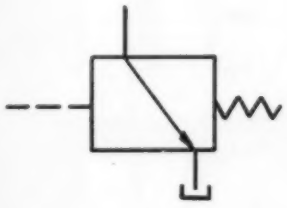
(Continued from page 14)

mal hydraulic oils of relatively low viscosities (up to 500 SSU), the bottom clearance between the teeth when meshed is sufficient to allow most of the liquid which would seemingly be 'trapped' to escape along the tooth to the sides of the gear." We in no way mentioned that we limited our application to a 500 SSU viscosity. We merely attempted to limit our statement to hydraulic oil applications where the viscosity does not exceed 500 SSU. Our herringbone gear pumps have been used to pump liquids as high as 2,000,000 SSU viscosity.

E.R.

A symbol of an unloading valve is shown on page 72 of the March issue of APPLIED HYDRAULICS. Although the J.I.C. system does not rigidly specify how each valve should be shown, it does establish a pattern to be followed. Pressure controls respond to pressures opposing the spring, so that the control pressure should be shown working against the spring load. Inlet and outlet should be on the sides of the rectangle. This is shown in the accompanying sketch.

K.C.



We are glad to make this correction. Will those who are clipping the "Know Your Symbols" sheets make this correction on the March page on unloader valves? To K.C. our thanks and a copy of the Proceedings of the 1950 NCIH.

Please send two reprints of the article "Hydraulic Steering of Rubber Tired Earthmoving Equipment" which appeared in your February issue. Is it possible to obtain a complete set of "a Beginner's Course in Basic Hydraulics"?

F.Z.

We are sending you the reprints as requested. The Beginner's Course is not yet complete and we have no present plans to reprint the series. The principal source of this series, particularly the earlier installments, was a Navy training text "Basic Hydraulics" which is still available from the Superintendent of Public Documents, U. S. Government Printing Office, Washington 25, D. C. at $1.50 per copy.

ADEL

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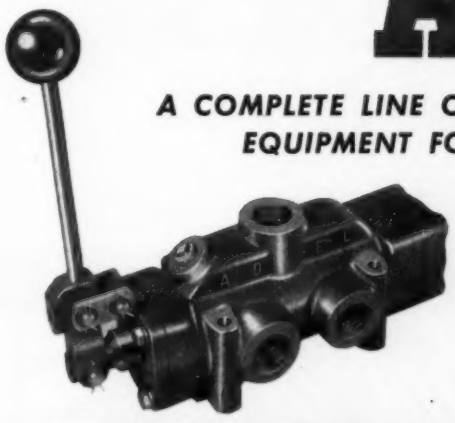

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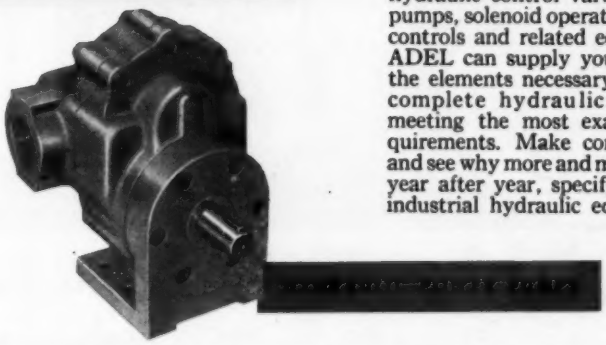

A FEW SELECT TERRITORIES ARE STILL AVAILABLE TO PROGRESSIVE DISTRIBUTORS OF HYDRAULIC EQUIPMENT. INQUIRIES INVITED.

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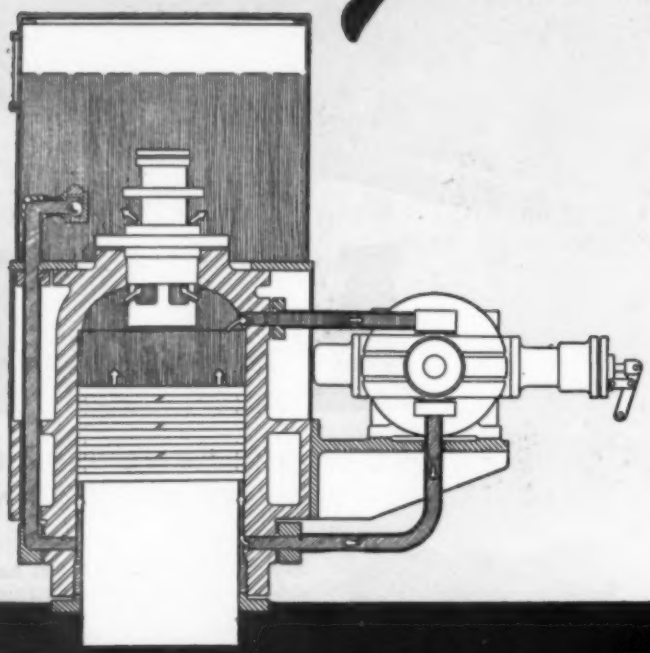
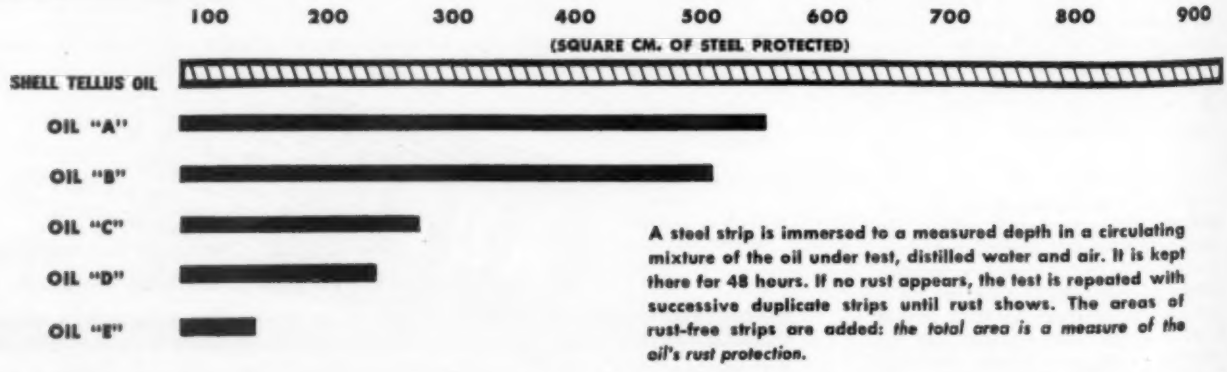
Today's surest ...for



Improved SHELL TELLUS OIL

LOOK AT THIS RUST-INHIBITION TEST



A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added: *the total area is a measure of the oil's rust protection.*

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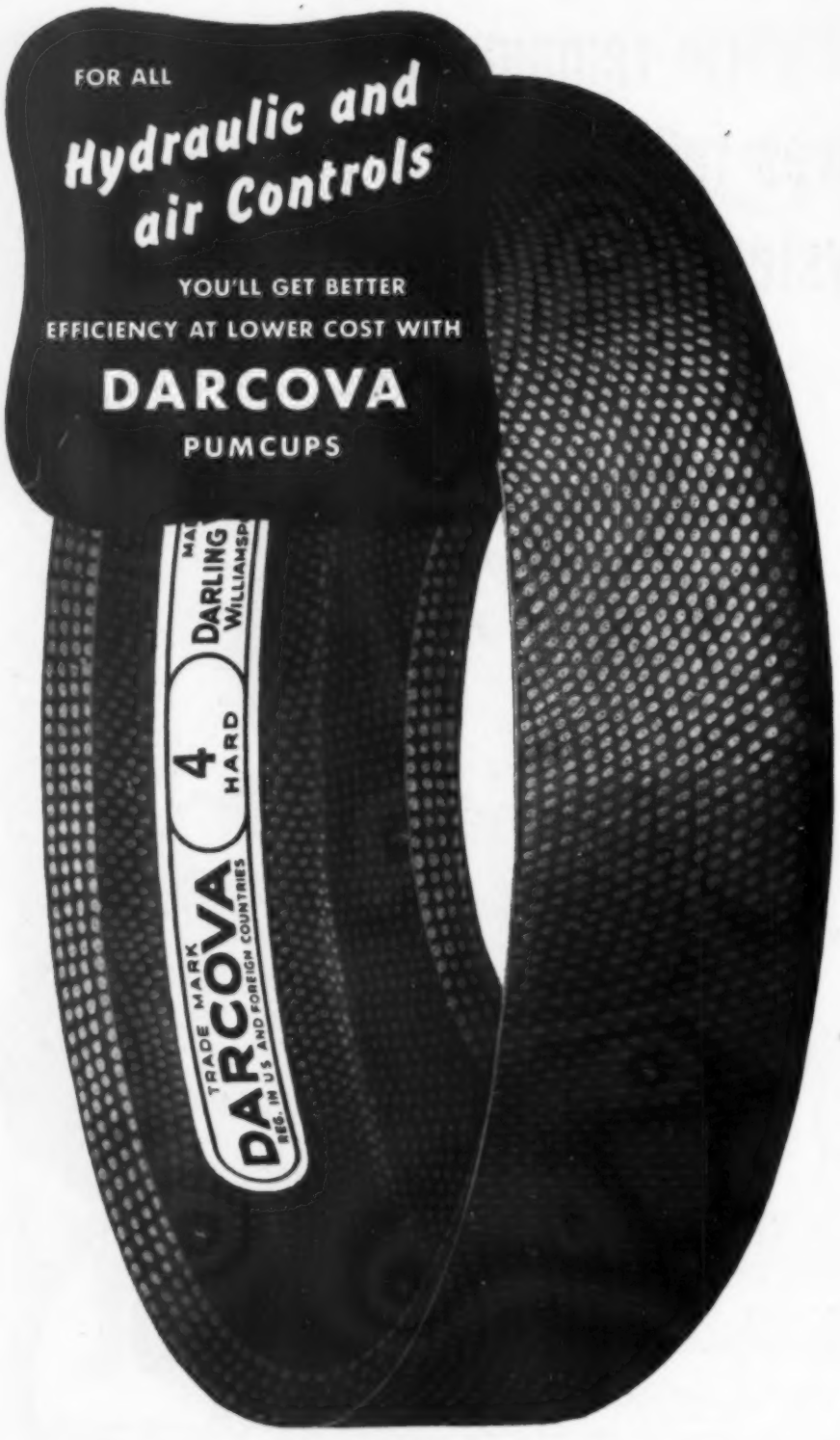

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THE ORIGINAL COMPOSITION CUP
PUMCUPS

LITERATURE AND SERVICES OFFERED IN THIS MONTH'S ADS

ULRICH Manufacturing Company has prepared a new circular giving complete information on their line of quick couplers for hydraulic hose applications.

Circle 17 on Reader Service Card

LEAKPROOF CHECK VALVE, made by James-Pond-Clark for pressures to 3000 psi, is detailed in engineering sheets.

Circle 49 on Reader Service Card

FOR AIRCRAFT APPLICATIONS, Pesco's "pressure loaded" gear type pump is described with complete specifications and performance charts.

Circle 3 on Reader Service Card

HOSE ASSEMBLY specification sheets have been prepared by the Resistoflex Corporation for their oil-proof, flexible assemblies.

Circle 43 on Reader Service Card

BOOSTER PUMP for steering is one of the many applications for Roper pumps. The complete line is shown in an available catalog.

Circle 69 on Reader Service Card

NEED OIL SEAL DATA? Sealol Corporation offers engineering recommendations to help solve your specific sealing problem.

Circle 44 on Reader Service Card

RUST INHIBITED hydraulic fluid is one of the protective features detailed in available information on Shell Tellus Oil.

Circle 21 on Reader Service Card

VALVAIR offers Bulletin A-6 giving specifications on their line of air valves.

Circle 7 on Reader Service Card

CATALOGS providing complete size and application data on Tomkins-Johnson air and hydraulic cylinders are available.

Circle 30 on Reader Service Card

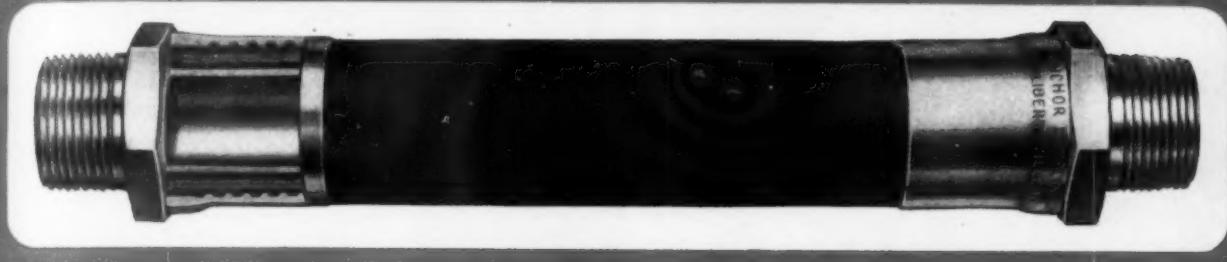
DENISON FLUID MOTORS for torque applications to 5585 inch-pounds are the subject of available bulletins.

Circle 27 on Reader Service Card

(Continued on page 30)

ANCHOR

Assembled Hydraulic Hose Units



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Factory-assembled to your specifications—save you time and money, give you a better job

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Anchor adapter unions save assembly time and piping expense. Use them and other styles of related Anchor fittings to simplify your piping problems.

FOR longer service life — you design your machines with great care and manufacture them to rigid tolerances.

But the job is not done until you invest the same care in selecting and specifying hose units. After all, the performance of your machines is dependent upon them.

That's why Anchor offers factory-assembled hose units. They are made to exact lengths in accordance with your drawings. And the couplings are factory-applied by experts with specially designed machines to give you leakproof dependability and extra safety. They cost less in the long run — because they give better service, keep your customers satisfied.

Shown here is a rayon two-braid hose-assembly designed for medium and low pressures. Made from specially selected synthetic rubber, it has excellent flexibility. This same unit is also available in a single-wire braid hose.

For high pressures Anchor Ductile-sleeve hose-couplings are your best choice.

Take out performance insurance. Reduce assembly time and costs in your plant and in the field. Equip your machines with Anchor factory-assembled hose units.

Send for complete information on Anchor assembled hose units.

Clip coupon to company letter head —and mail TODAY!

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Libertyville, Illinois

I like the dependability, the safety, and the time-and-money-saving features of Anchor Assembled Hose Units. Please send me Bulletin No. 485.

Name..... Position.....

Company.....

Company Address.....

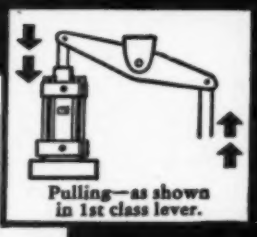
City..... (.....) State.....

D-2

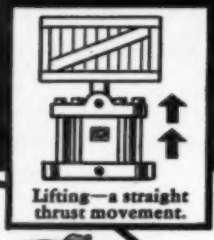
Rasslin' with HIGH COSTS?

SAVE on "MUSCLE JOBS" with T-J CYLINDERS

Toggle—a typical pushing operation.



Pulling—as shown in 1st class lever.



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35 YEARS EXPERIENCE (T-J)

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Circle 30 on Reader Service Card

(Continued from page 26)

BULLETINS offered by Adel Division of General Metals Corporation give specifications on their complete line of hydraulic power and control components.

Circle 20 on Reader Service Card

EFFICIENCY AND COST savings of Darcova Pumcups for air and oil service are emphasized in a free illustrated bulletin.

Circle 26 on Reader Service Card

PIPE PLUGS for pressure systems are discussed in engineering data available from Allen Manufacturing Company.

Circle 46 on Reader Service Card

HANSEN HIGH PRESSURE shut-off couplings are detailed in an available catalog.

Circle 10 on Reader Service Card

AIR VALVES arranged for foot operation are described in literature prepared by C. B. Hunt & Son, Inc.

Circle 45 on Reader Service Card

CYLINDER ROD PROTECTION is provided by metallic rod wipers as illustrated in literature offered by HYdraulic Accessories Co.

Circle 48 on Reader Service Card

JIC PNEUMATIC STANDARDS neatly compiled in a handy folder are available from Miller Motor Company. Bulletin 200 describing the Miller fluid pressure booster is also offered.

Circle 22 on Reader Service Card

NEW GEAR PUMP SERIES for low pressure handling service is detailed in material available for from Industrial Pump Division, Oberdorfer Foundries, Inc.

Circle 13 on Reader Service Card

PRESSURE SEATED AIR LINE VALVES which are self-bleeding when closed to make it easier and safer to uncouple tools, are described in Bulletin HF 747 prepared by the Cleco Division of the Reed Roller Bit Company.

Circle 18 on Reader Service Card

3-WAY AND 4-WAY hydraulic valves made by Yarnall-Waring Co. for pressures to 5000 psi are shown in Bulletin H-210.

Circle 71 on Reader Service Card

Fig. 1. General view of the 18 inch, four-high, cold finishing mill in the Riverside Metal Company plant. The charging operator is shown at his position between the downender and the machine entry guide. The capacity of the conveyor permits a good lot run at one setting of the rolls.

A STRIP MILL MODERNIZES

THE INSTALLATION OF TWO NEW FOUR-HIGH STRIP MILLS IN THE Riverside Metal Company plant at Riverside, N. J., both utilizing hydraulic and pneumatic circuits, marks a major step in the complete modernization of this company's strip mill. Other heating, rolling and material handling equipment is being added as rapidly as possible without disrupting the regular day-by-day operations.

The large mill—a 6¾ x 23 x 18 inch four-high, non-reversible, cold finishing mill (Figure 1 and 2) incorporates the latest automatic design from the standpoints of both manipulation and material handling. The mill will take coils of strips up to 15 inches in width, weighing up to 700 pounds and will roll them at speeds from 200 to 600 fpm. It is capable of reducing .050 thickness sheet down to .005 inches—the number of passes depending on the work-hardening properties of the metal and the finish temper specified.

Primary power for the mill is supplied by a 400 hp motor-generator which drives all the mill motors. Separate motors drive the two double hydraulic pumps which supply the seven hydraulic cylinders in one circuit to perform handling, positioning, feeding and wrapping operations. A second hydraulic circuit, the roll balance system, is

Seven hydraulic and four air cylinders are remotely controlled to perform the handling, positioning, feeding and wrapping on these new copper alloy strip mills in the Riverside Metal Company plant.

incorporated into the basic design of the machine. Each of the cylinders in the "auxiliary" operations circuits is operated by three position, four-way, closed center valves, remotely controlled through a central "pulpit" type station by receiver and transmitter (master and slave) units.

Flow control valves are installed in both supply and return lines to and from each of the seven cylinders (Figure 4); it is a simple matter to pre-set the return oil flow to retract the cylinder pistons under no load at the same speed the pistons advance under varying loads.

The air circuit consists of four air cylinders, four-way closed center valves operated manually by remote control from the pulpit and pairs of speed control valves. The latter are installed in both supply and return lines of the four air cylinders. The regular 100 psi mill air supply is used.

The smaller, "pony" mill is also, a four-high cold finishing mill. This mill a 2-½ x 9 x 9 inch strip mill, can roll copper alloy strip in widths up to 7¾ inches, handle stock of a maximum thickness of .030 down to .003 inches at a top speed of 700 fpm.

The conveyor around the large mill, Figure 1, serves a double purpose. It acts as a reservoir for stock during one pass through the mill, as well as a loading area for the strip after its last pass, when it is picked up and taken to the Drever furnace for process annealing. The capacity of the conveyor in strips, therefore, determines the amount of stock that can be conveniently run through the mill in any one setting. This is more than sufficient to take care of many special or not too large orders.

Cycle of Operation

With the mill motors running and the initial supply of stock on the in-feed side of the conveyor, the nearest strip rests against the vertical face of the downender. With the mill set for the first pass, the operation begins.

The pulpit crewman operates all valves for all hydraulic and air cylinders from his position at the side of the mill. He can follow the progress of the strip visually. All cylinders are controlled by hydraulic receiver and transmitter (master and slave) type units, operated remotely by lever movements at the pulpit.

The pulpit operator moves the downender lever. The downender air cylinder extends, moving one strip over the coil lift. As the coil lift (hydraulic cylinder) begins to extend (raise), the downender cylinder retracts.

The charging hydraulic cylinder extends, pushing the strip into the loading position over the tension reel. The payoff reel traverse cylinder (hydraulic) extends to center the payoff reel, centering the stock for entry into the machine. The hydraulic cylinders retract.

The strip is centered on the payoff reel. The payoff reel is then placed under operating tension by the extension of the reel, expanding the rotary hydraulic cylinder. The entry guide air cylinder

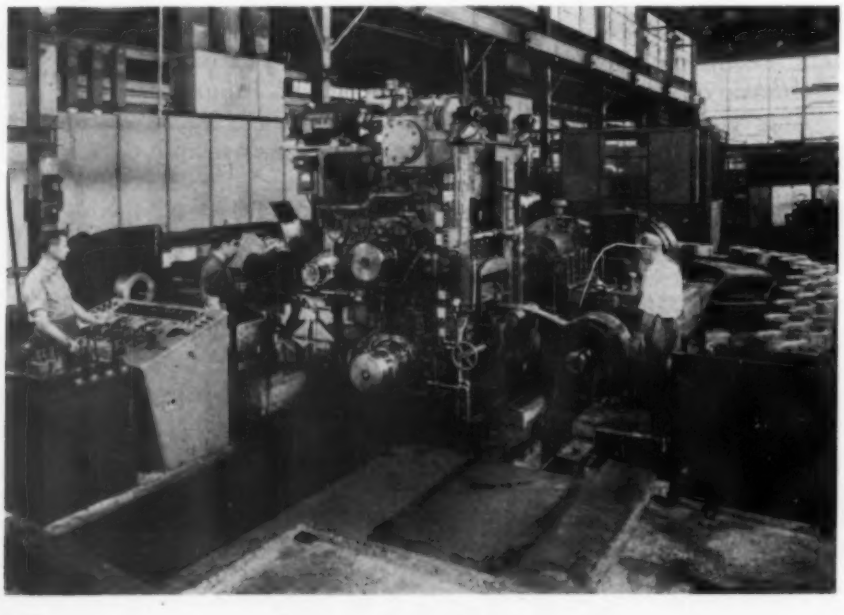


Fig. 2. All hydraulic and air valves are remotely controlled by receiver and transmitter type units from a pulpit control center. The strip is passing through the machine, the discharging operator (center) waits for the strip to wind up on the wrapper shaft.

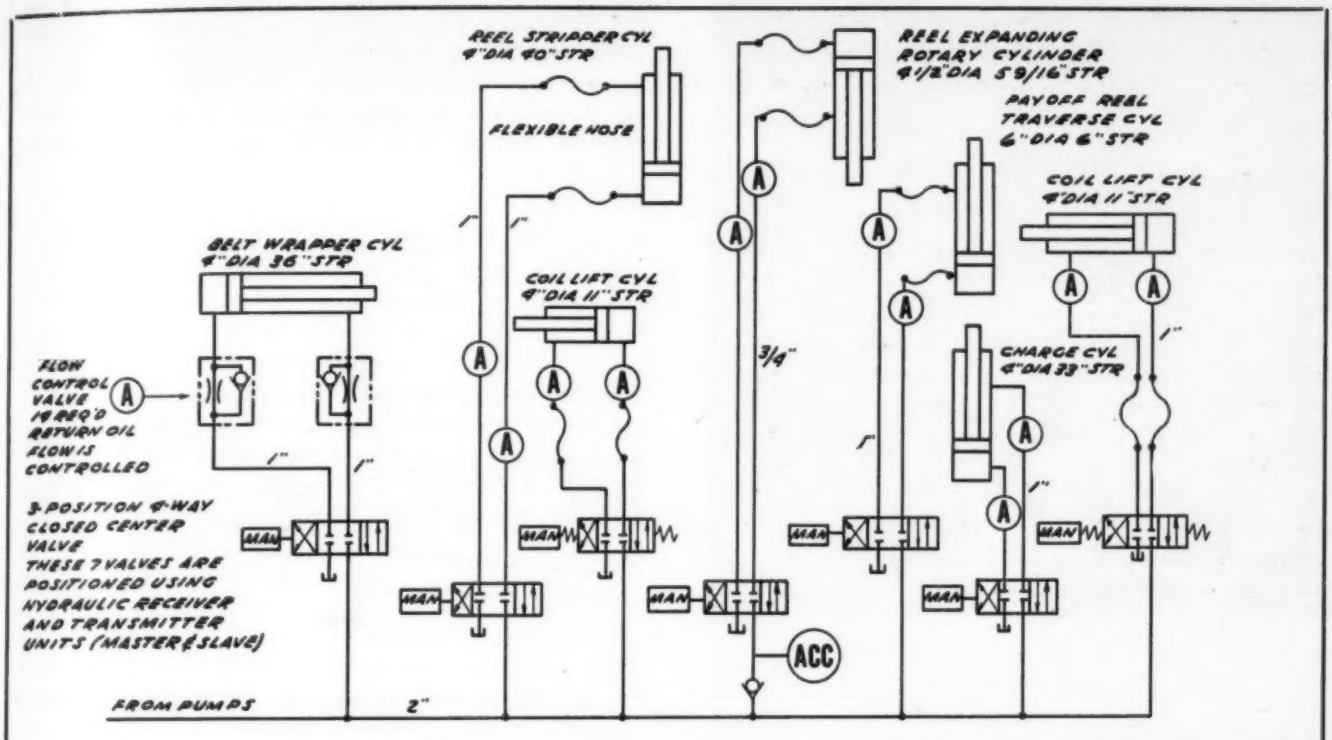


Fig. 4. The hydraulic circuit has seven cylinders operated by four-way closed center valves remotely controlled by receiver and transmitter units.

aligns the end of the strip as the operator feeds the strip over the guide roll into the machine.

The strip makes one pass between the mill rolls; the strip as it leaves winds up on the wrapper shaft. A tension reel brake cylinder acts as an air brake to stop the end of the strip between the strip and a guide roller.

An elevator at the discharge end of the mill is raised to receive the strip. The elevator, similar to the initial elevator, is elevated by the extension of a hydraulic cylinder. At the same time the strip is pushed off the wrapper shaft by the reel stripper hydraulic cylinder onto the elevator.

At this point the unloading operator ties a wire around the strip and pushes the strip off the elevator onto a short roller conveyor which carries the strip over the downender. The downender air cylinder had extended to receive the strip. The cylinder retracts, lowering the strip and depositing it on the holding conveyor.

As noted above, the roll balance system is incorporated into the mill itself. The purpose of this system is to keep the top roll assembly separated from the bottom assembly and held against the adjusting screw joints. The system consists of a weighted accumulator, vane pump, tank and operating valves. The bottom work chock contains a pair of cylinders for carrying the top work roll assembly and the bottom backup chock contains cylinders for carrying the top backup roll assembly.

Pressure in this hydraulic circuit is ample to lift the assembly and hold it securely against the screw joints. Leakage from the accumulator is replaced when the accumulator drops to contact a limit switch which will start the pump. The pump will stop on reaching a switch at the top of the stroke.

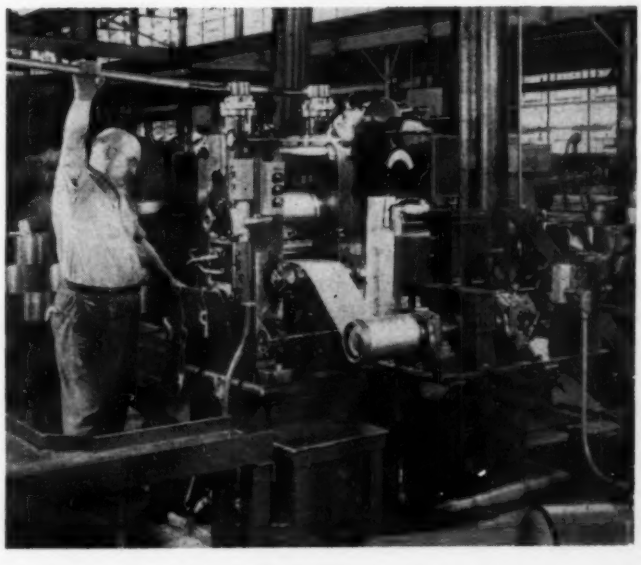


Fig. 3. The 9 inch "pony" finishing mill is used for smaller lot runs; the overhead bar operates the roll balance valves. A weighted accumulator, in the hydraulic roll balance circuit of the pony mill is in the background.

Fig. 1. Dana Ross, production operator, at work on the second improved model of the air powered "tango" machine. He merely loads the handle halves into the die on the inner movable platen. The three movements of the die and the automatic operation of the air ejection blow-off average a 4 second cycle with light work.

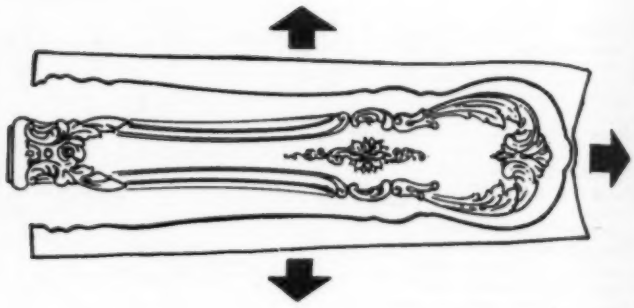


Fig. 2. This sketch indicates the directions of the three trimming motions.

By W. H. RATHGEBER

Old Industry—New Methods

. . . Making fine silverware is one of our oldest crafts. Air powered tooling has eliminated tedious hand work while maintaining time honored standards of quality.

A PROBLEM THAT HAS LONG PERPLEXED THE FINE silver cutlery industry—the trimming of handle halves to an accuracy that eliminates the hand finishing of edge irregularities—has been solved by the use of a new method of shearing by means of the air operated and electrically controlled "tango" machine. Neither of the two traditional methods of trimming, skiving in a planer type machine or by pushing the part through a die was entirely satisfactory. The new method utilizes three distinct directions of motion to achieve definite shear action that gives clean, smooth edges ready for soldering and at a rate much faster than possible before.

Contrary to popular belief, sterling silver cutlery handles are not solid silver, nor are they always a one-piece shell; rather they are a fabricated hollow-handle made up of two identical halves, silver soldered together so carefully that, in most cases, the seam is imperceptible. The thickness of the silver used for making these handles varies from .010 up to .050 inches in the very heavy weight lines, the average being approximately .025 inches.

The handles are formed from flat sheet stock in a striking die, which both shapes and raises the ornament in one operation. One of the chief headaches in this type of manufacture is the trimming of the excess metal after the piece has been struck. Figure 4 shows the four stages of manufacture.

Neither skiving nor the use of a shaving die has

W. H. Rathgeber is Superintendent Tools and Machinery, Towle Manufacturing Co., Newburyport, Massachusetts.

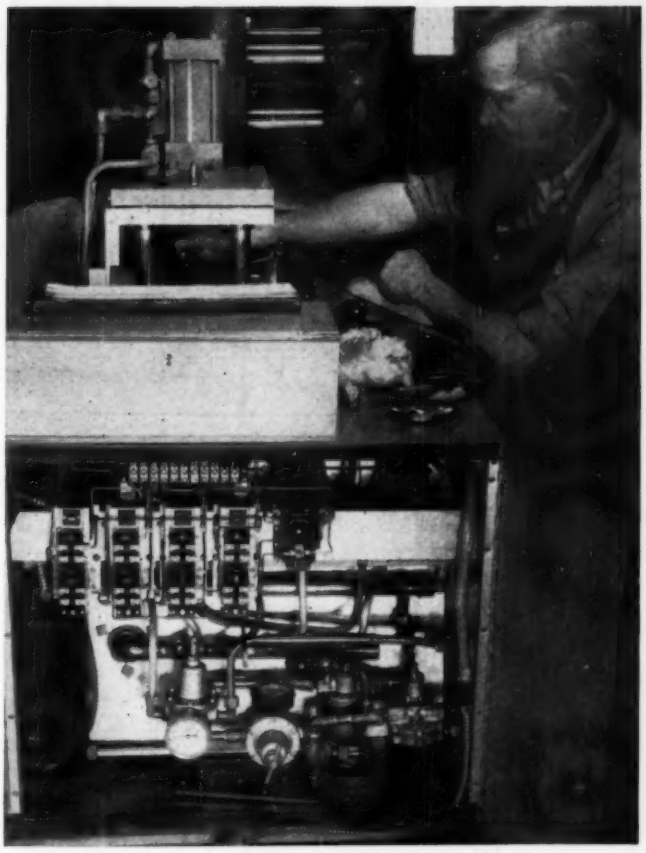


Fig. 3. A side view of the machine with the control box door open. The four air timing relays, pressure regulator and filter-lubricator units are shown.

been entirely satisfactory since they are apt to leave irregularities in the edges. The engineers of Towle Silversmiths tackled this problem and came up with a new method for achieving near perfect results.

The basic underlying principle of the machine as ultimately developed was that the optimum cut could only be performed by shearing the stock at right angles to the edges. The sketch, Figure 2, clearly indicates that there are three distinct directions of motions that must be obtained in order to accomplish this.

The tools for holding the piece of silver while the trimming action is in process have been developed for a number of years and have been used in a standard shimmy press with moderate success. However, due to the fact that the shearing motions were at exactly 90 degrees to each other, a small amount of tearing of silver resulted.

To overcome this, it was further decided that the cutting action should pivot about an imaginary point to give a definite shear action. To illustrate the action for management, a working wooden model was constructed and from that point the ideas were carried to the drafting board.

The final design of the so-called "tango" machine (the nickname was given because of the motion of the moving parts) called for a basic assembly of a four post die set especially designed with an extra heavy base, movable platen and a fixed top. The central section of this die set was cored out and machined to receive an inner guided platen in which the tools would be mounted. By use of four separate air cylinders mounted, one on top, one each front and back and one at one end, four distinct motions were obtained as follows:

(1) Top air cylinder closes the trimming tools.
(2) Front cylinder moves inner bed, so as to shear front edge of the shell.

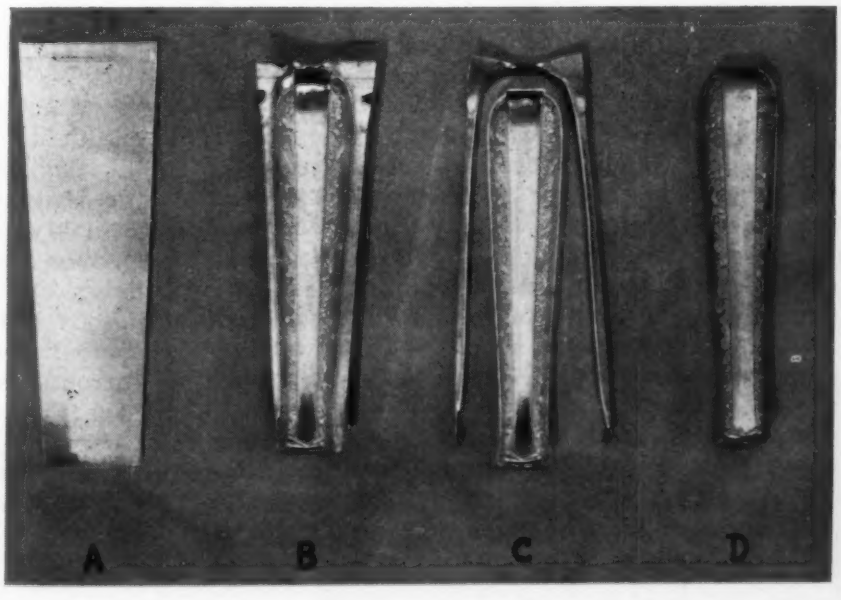
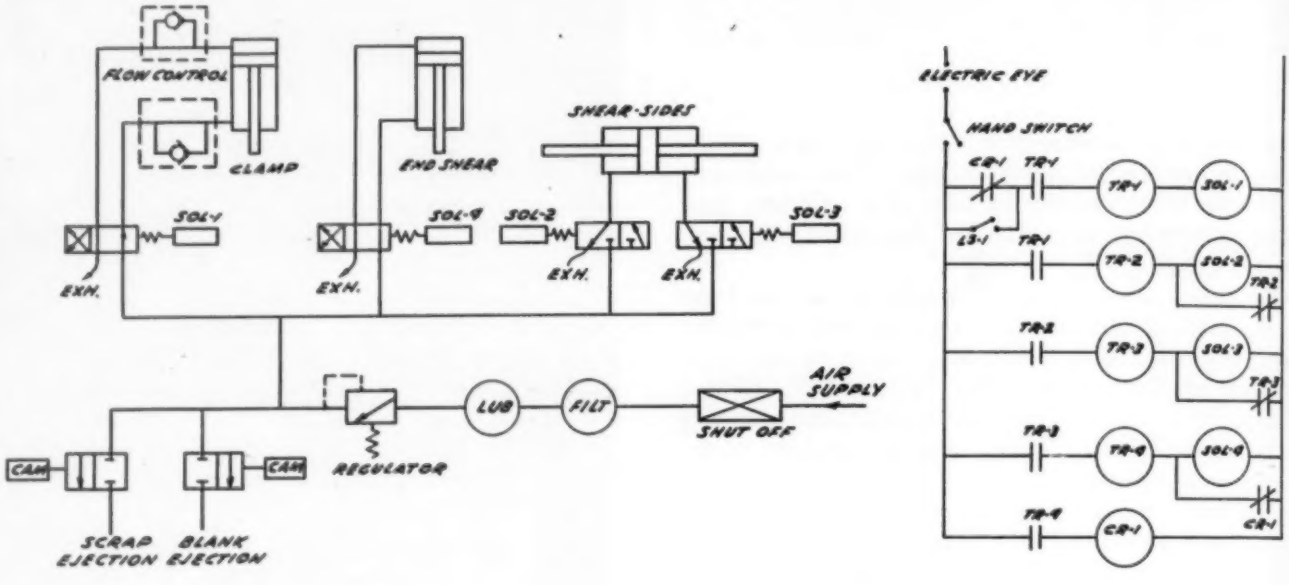


Fig. 4. The four stages in manufacture of cutlery handles: (A) the sheet stock; (B) the piece as it comes from the striking die; (C) the piece after trimming, with flash; and (D) the finished handle.

How Timers Control "Tango" Air Cylinders



1. Operator moves hand switch. The first pair of TR-1 contacts close to energize timer TR-1 and Sol-1 to move the clamp cylinder down.

2. After a preset time interval, the second pair of TR-1 contacts close to energize timer TR-2 and Sol-2 to move the double ended shear cylinder to cut one side of the work.

3. When TR-2 times out, normally closed contacts TR-2 open to deenergize Sol-2 and a pair of open contacts close to start timer TR-3 and energize Sol-3. Sol-3 controls its 3-way air valve to move the shear cylinder to cut the opposite side of the work.

4. TR-3 times out to deenergize Sol-3 and start TR-4 energizing Sol-4. Sol-4 actuates the 4-way air valve to move the end shear cylinder.

5. TR-4 times out and energizes control relay, CR-1 which opens one pair of contacts CR-1 to deenergize Sol-4.

6. As the end shear cylinder moves forward limit switch, LS-1, closes to act as an interlock for normally closed contacts CR-1 which opened when CR-1 was energized. On the return of the shear cylinder, the limit switch opens to deenergize all the timers. The clamp cylinder moves up, and the part and scrap are blown from the die.

The double ended side shear cylinder is returned to center position by a cam moved by the action of the end shear cylinder.

(3) Rear mounted cylinder moves inner bed, so as to complete cutting action on the second edge.
(4) End mounted cylinder moves inner bed, so as to cut across the end of the handle.

The control circuit necessary for the sequence of operations for the air cylinders was developed by using four pneumatic delay-timers, so wired together as to operate four individual solenoid operated air valves. After machining and fabrication was completed in the Towle Company's well equipped machine shop, the parts were returned to the Engineering Department for assembly.

Preliminary trials of the operation of the machine, as well as testing for the accuracy of the moving parts, the control circuit and the air supply lines were temporarily connected, using lamp cord and air hose. This method permitted elimination of "bugs" without the continuous dismantling and re-assembly of parts that would have been necessary had the machine been given the final assembly. After processing several production lots of work through the machine, the Engineering Department was satisfied that the design was mechanically sound and the final assembly was made incorporating the use of air ejection blow-offs automatically tripped, drop delivery chutes, electric eye safety cut out, work aprons immediately in front of the machine and a tubular steel work stand designed especially to surround two sides of the machine to hold tote pans, Figure 1.

An important phase in the final try-out and proving was the cooperation of Dana Ross, a production operator in the plant, who operated the machine. He was urged to be critical and com-

(Concluded on page 68)

One of a series, taken from the files of a hydraulics engineer, to show how fluid power is teamed with electrical control. While each installation is designed for a specific application, the circuits are typical of the jobs you encounter.

CIRCUIT HINTS

TIMING RELAY

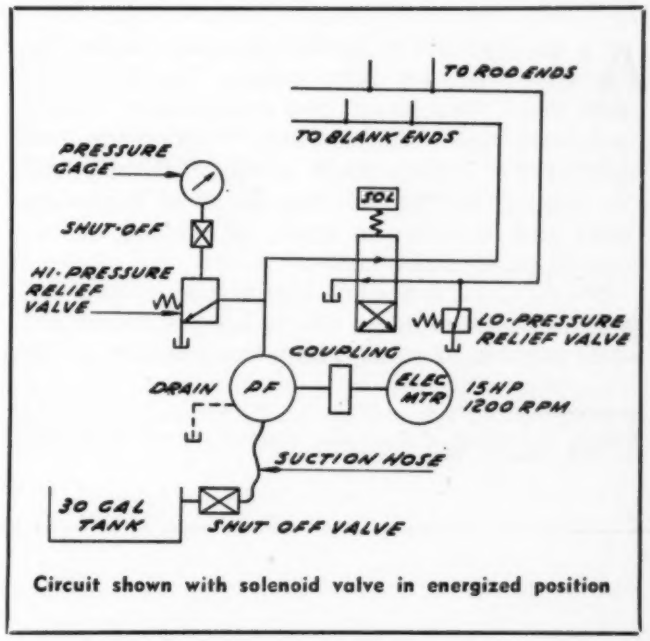
Provides Simple Stroke Reversal

By RUPERT P. ESSER

Hydraulic Circuit A series of piercing tools, powered by oil cylinders, is supplied by this system. The single solenoid operated, spring return, 4-way, two position valve controls the direction of stroke. All pierce tools operate simultaneously. A fixed displacement vane pump, foot mounted to the top of the reservoir will deliver 12 gpm at pressures up to 2000 psi. A 1¼ suction hose connects the pump to tank.

A high pressure relief valve on the discharge line controls the maximum system pressure. 1500 psi is approximately the correct setting for this piercing job.

The low pressure relief valve set at approximately 125 psi permits sufficient pressure for the upstroke. When the machine is in standby position, with the pump running, oil pressure unloads back to tank through the low pressure relief valve, preventing harmful heating of oil, and resulting in power savings during idling.

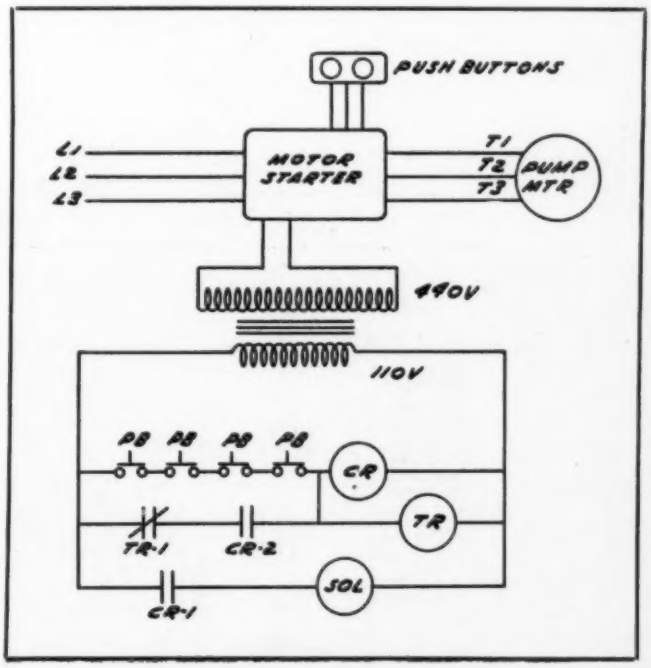


Circuit shown with solenoid valve in energized position

Electrical Circuit Four push buttons in series, two at each end of the machine assure safety to the operators. All buttons must be depressed to start the cycle. Relay CR and timer TR are energized. Normally open contacts CR-1 are closed to energize the hydraulic valve solenoid, and contacts CR-2 close to provide an interlock to hold the circuit after the buttons are released.

After the expiration of the adjustable time delay, normally closed contacts TR-1 open to drop out both relays and deenergize the solenoid valve. The valve is spring returned to the starting position, causing the cylinders to return upward.

The timer is set between 5 and 6 seconds, just long enough to permit all cylinders to complete the down or work stroke.



Rupert P. Esser is chief engineer of TEC Engineering Corp., Logansport, Indiana.

FAST SETUP — Short Run Efficiency

Flexibility of this carton making machine offers circuit ideas for many similar applications.

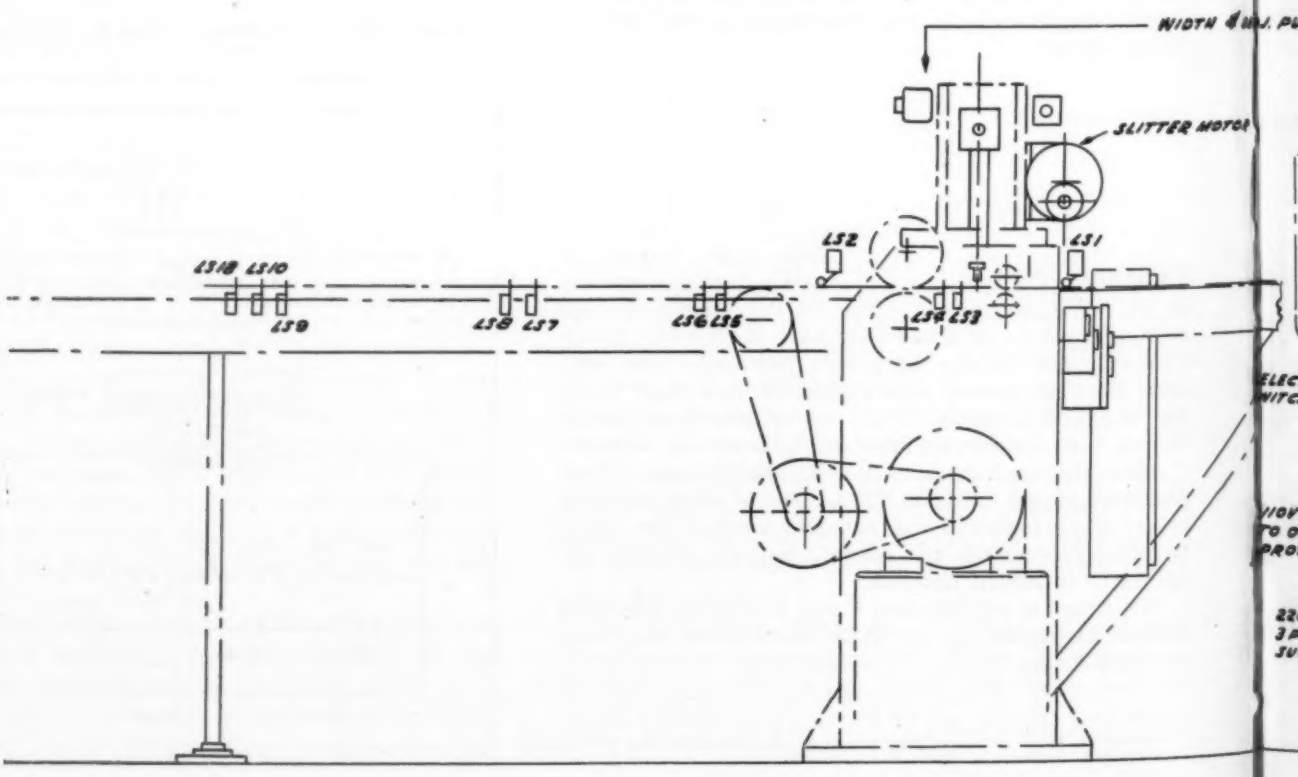
By WILLIAM C. OBEREM

AN ELECTRICALLY CONTROLLED AND HYDRAULICally operated box making machine, the "Rite-Size", developed and marketed by Jacob Industries Sales Corporation, New York, and built by the Buffalo plant of Farrel-Birmingham Co., Inc., is setting new standards in flexibility, speed and economy in small lot making of corrugated paper stock boxes.

The machine is designed for fast setup and high rates of production (to 600 boxes per hour) and, while capable of steady, long run production, the flexibility of the "Rite-Size" makes it particularly valuable for special and short run box making. Literally thousands of sizes of boxes can be made with the machine; the fast setup (two minutes or less to reset the controls) making it possible to make a changeover in size and make 50 boxes in five minutes.

The new hydraulic box maker does not displace equipment designed for quantity production of commonly used size boxes. It does provide an economical means for producing short run quantities. The machine will handle stock sheets to widths of 65 inches in any length that can be handled conveniently; it will slot and score a

William C. Oberem is Executive Engineer, Farrel-Birmingham Co., Inc., Buffalo, New York.



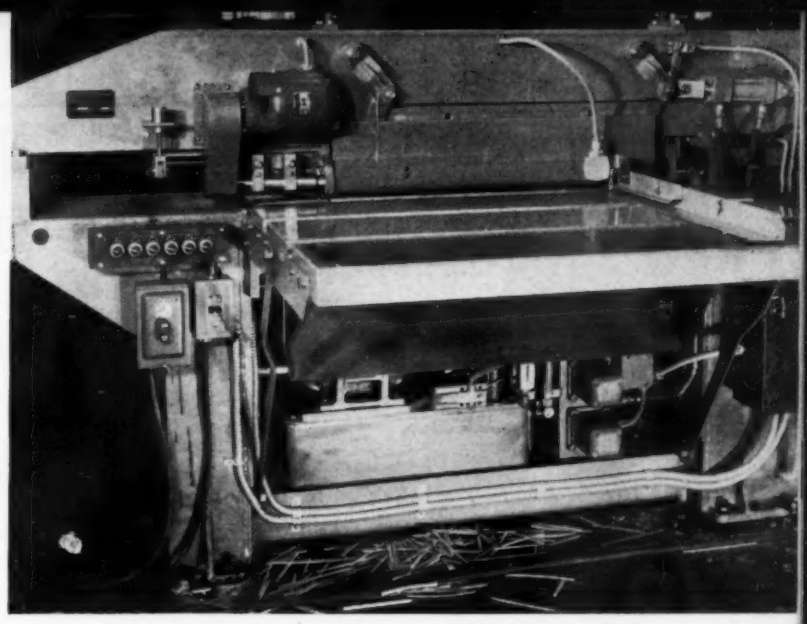


Fig. 1. Front or loading end of the automatic box making machine showing position of the starting roller arm limit switch at right guide edge, slotter cylinder (with hose), slitter motor, starting and selector switches.

blank up to 36 by 108 inches. Any commercially available grades of box stock can be worked.

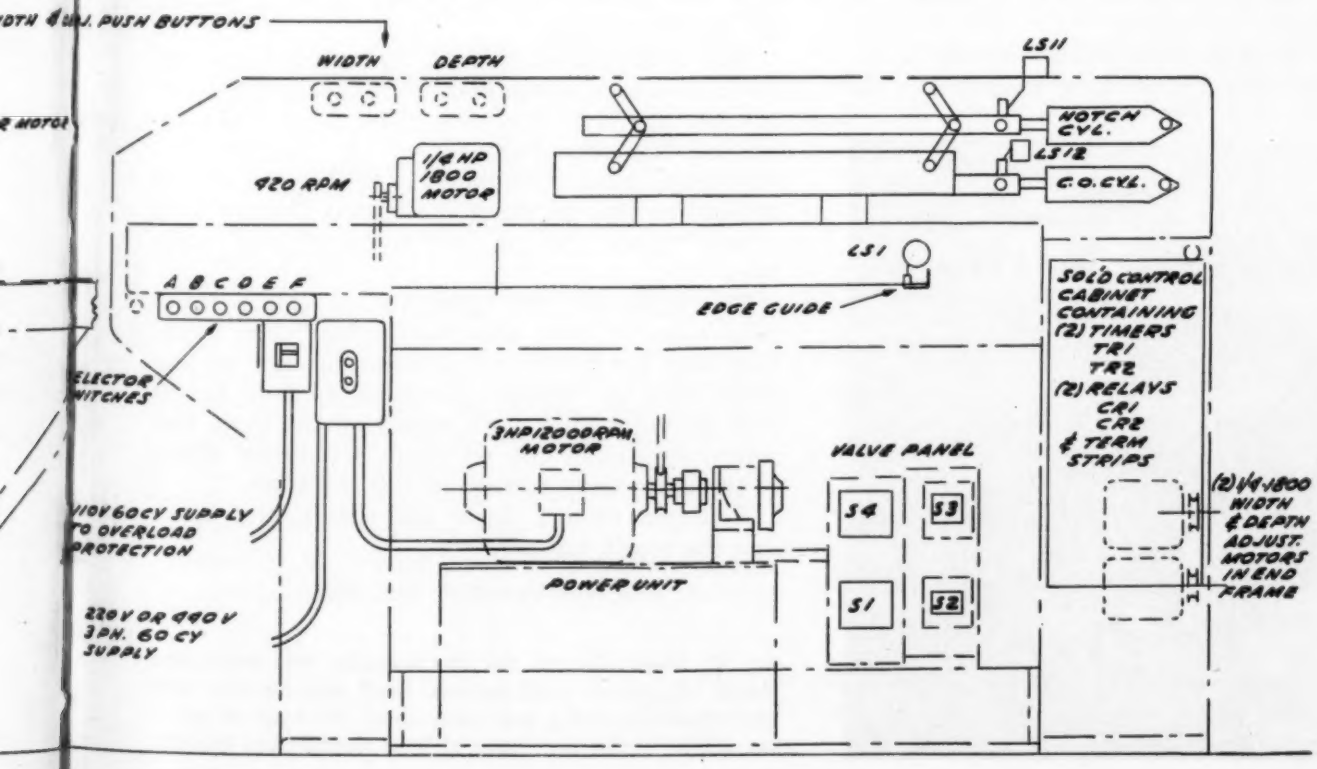
In addition to the regular slotted carton, the machine will produce half-slotted containers, two-piece telescope boxes, double-cover boxes, two piece folder, five panel folder, double and triple slide boxes. It has made liners and partition pieces, blanks for regular and reverse radio pads and flanged trays.

Fig. 2. Plan and elevation sketch of the box machine showing the location of the limit switch control system.

The box making machine is operated by a hydraulic system in which cylinders actuate slotter and cut-off, a fluid motor drives the scoring rolls, width and depth adjustments are set by push buttons and the sequence of operation is controlled automatically by pairs of limit switches.

Hydraulic Operation

A three hp motor drives a vane type pump providing hydraulic pressure for a gear type constant displacement fluid motor and slotter and cut-off cylinders. Fluid motor and cylinders are controlled by four-way solenoid operated valves.



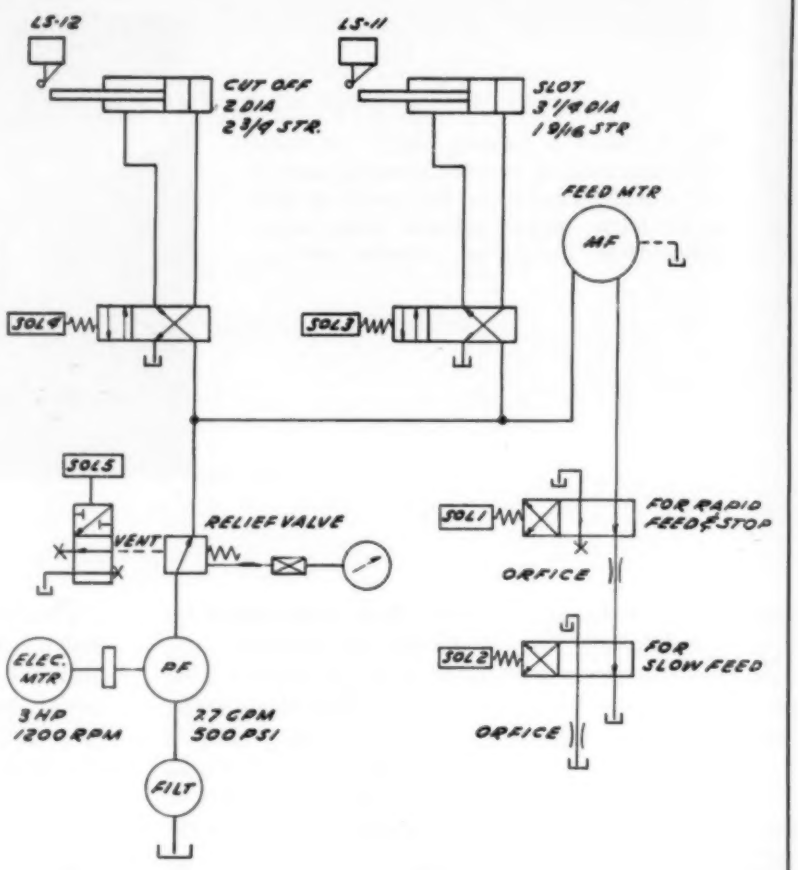
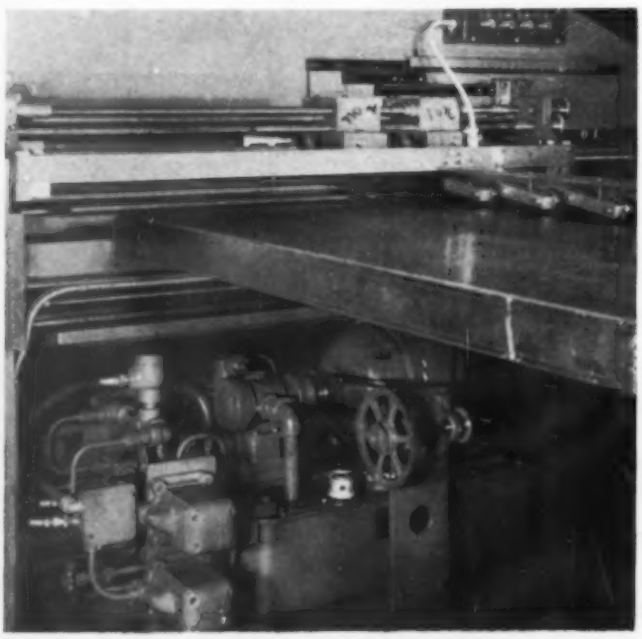


Fig. 3. Hydraulic circuit of the automatic box making machine. The valves are shown in rapid stock feed position. Solenoids 1 and 5 are energized; solenoids 2, 3 and 4 are deenergized.

A fifth four-way solenoid valve, off the relief valve line, is used to raise and drop the system pressure quickly.

A conveyor belt is driven off the pump motor shaft. The peak load requirement occurs when both rapid traverse of the stock and maximum pressure on feed and scoring rolls is called for simultaneously.

The power cycle of the hydraulic system is arranged so that there is working pressure in the circuit only during the actual operating time of the machine and so that practically the full volume of oil is used at all times. Oil is directed to either the fluid motor for traversing the stock or to the cylinders for slotting and cutting-off. There is no overlap of machine functions to disturb the balance of full power delivery during the working cycle.



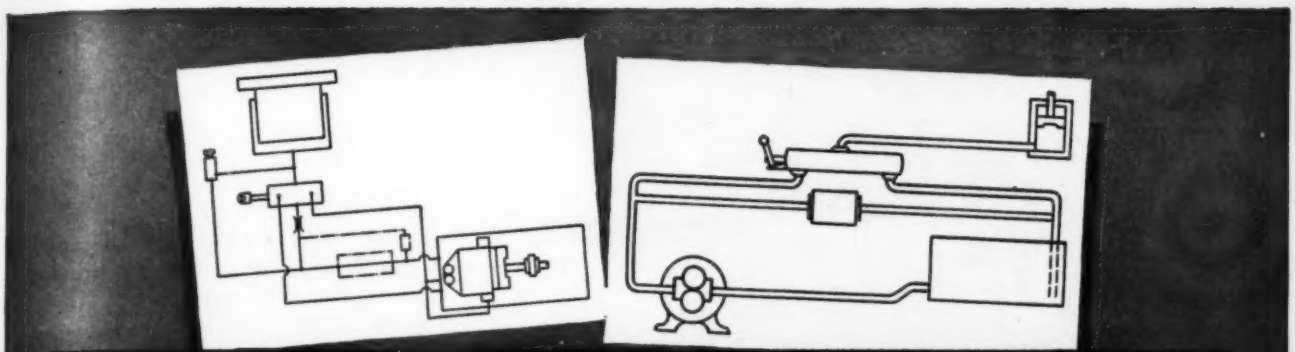
The hydraulic circuit for the production machine has been simplified from the original circuit in a prototype machine. The number of components has been reduced and the builder, Farrel-Birmingham Company, has been able to streamline the tubing of the circuit (Figure 3) to a very "clean" layout, easy to install and maintain.

The ingenious arrangements of sliding scales with pairs of limit switches to first slow down, then stop, the movement of stock through the machine and an overall electrical control circuit that provides automatic operation for easy, fast setup, results in the excellent flexibility which is an outstanding feature of this machine.

Separate motors drive the slitter, the depth and the width adjustments.

(Continued on page 70)

Fig. 4. Rear view of the box machine with width and depth adjustment push buttons, feed and creasing rolls (on adjustable slide) and table along the edge of which the sliding scales and pairs of limit switches are located.



A Beginner's Course in Basic Hydraulics

Chapter VIII

HYDRAULIC PUMPS

Part 6

Radial Piston Pumps

COST CONSCIOUS USERS OF HYDRAULIC EQUIPMENT will ask if their application requires the use of the more expensive piston-type pump. The decision, of course, is not solely determined by initial cost. Job requirements for efficiency, life, slip, pressure and control determine the economy of pump selection.

The radial piston pump can readily be built to give variable volume; and there are a variety of volume control mechanisms.

If there is anything like a hierarchy in pumps, piston pumps are right at the top in performance. These positive displacement pumps generate high pressures, most models are rated near 3000 psi with some designs going as high as 10,000 psi. Deliveries range to 200 gpm.

Figures 1, 2 and 3 illustrate the operating principle of the Oilgear radial, variable delivery pump. As the cylinder is revolved around the stationary pintle, or valve spindle, by the action of some driving source, the double row of radial pistons reciprocate in the cylinder block. The amount of in and out motion is determined by the position of the slide block which alters the eccentricity of the reaction ring.

Referring to Figure 3, as each piston passes the point of minimum clearance between the cylinder and reaction ring, the piston moves outward to draw in oil from the upper suction ports. Passing the point of maximum clearance, the piston is forced inward to discharge oil through the lower pressure ports. When the outer reaction rotor is shifted so that its center coincides with the center of the pintle, the pistons will not reciprocate and the discharge will be zero.

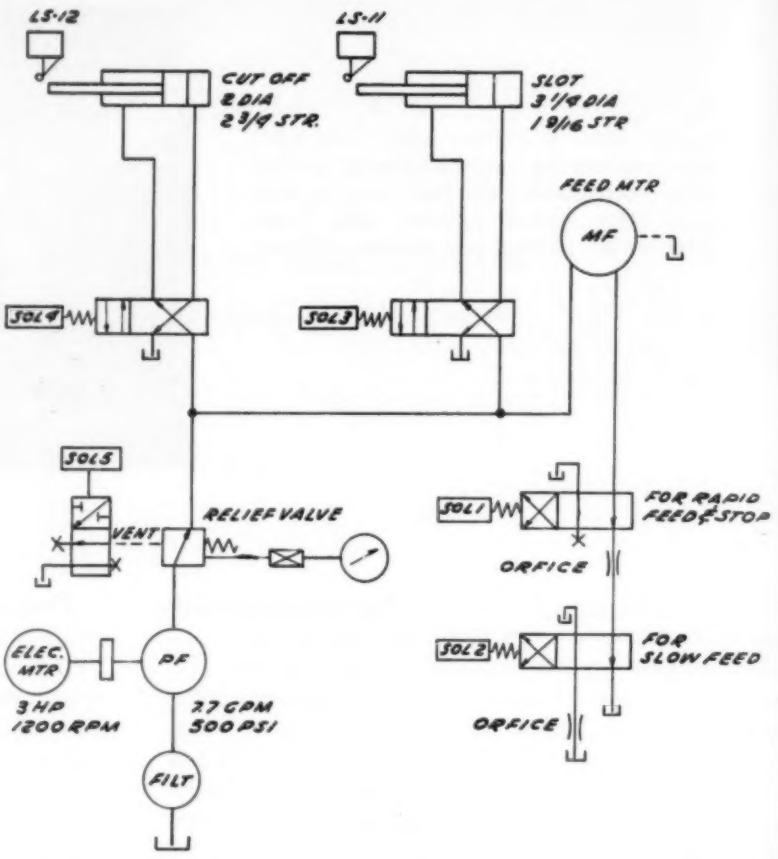
By omitting the moveable slide block this pump becomes a constant delivery unit, with the output determined by the fixed reciprocating movement of the piston.

Distinguishing Feature

The various makes of radial piston pumps are very similar in operation. Perhaps the most distinguishing feature is the method of transmitting the reaction of the pistons to the outer rotor.

The simple one piece piston heads on the Oilgear pump are so designed as to cause the pistons to rotate as well as reciprocate. This slow rotation is necessary to adjust for a difference in speed between the piston heads and reaction ring, and their points of contact with the reaction ring. The difference in speed is caused by differ-

Rotary piston pumps are built in both axial and radial designs. Next month we'll discuss the axial type and then follow with Part 8 on reciprocating piston pumps.



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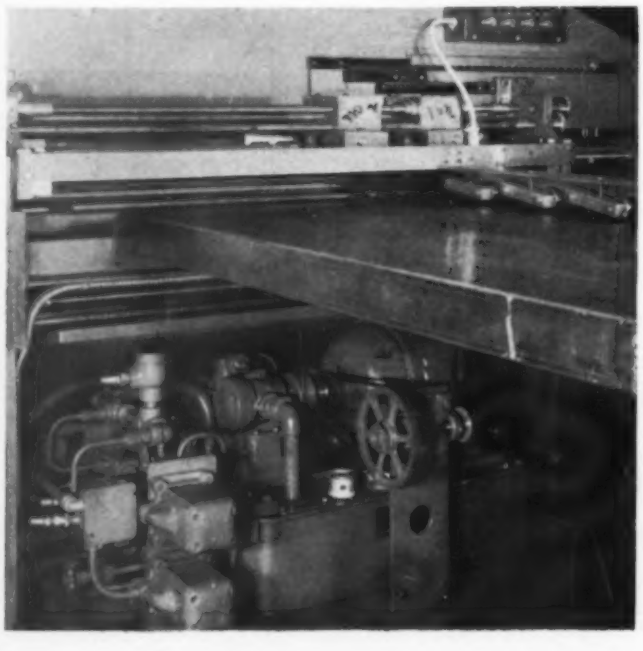

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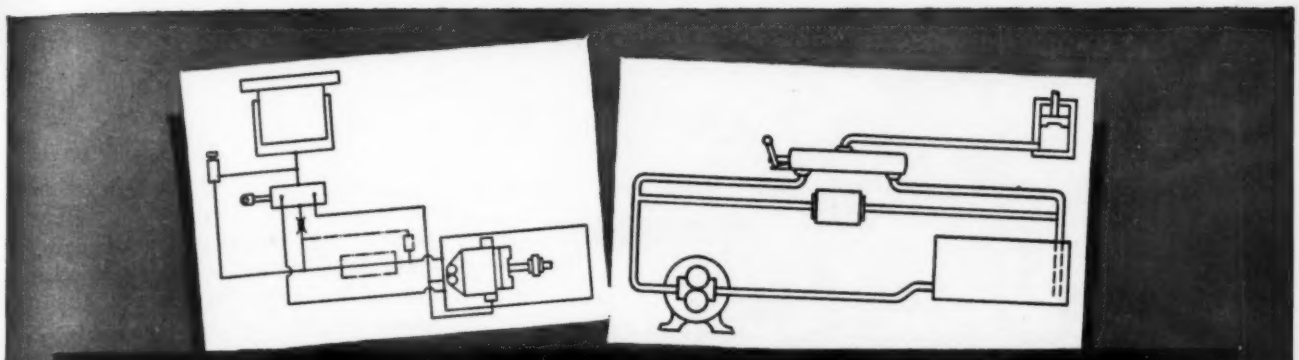
Separate motors drive the slitter, the depth and the width adjustments.

(Continued on page 70)

Fig. 4. Rear view of the box machine with width and depth adjustment push buttons, feed and creasing rolls (on adjustable slide) and table along the edge of which the sliding scales and pairs of limit switches are located.



A Beginner's Course in Basic Hydraulics

Chapter VIII

HYDRAULIC PUMPS

Part 6

Radial Piston Pumps

COST CONSCIOUS USERS OF HYDRAULIC EQUIPment will ask if their application requires the use of the more expensive piston-type pump. The decision, of course, is not solely determined by initial cost. Job requirements for efficiency, life, slip, pressure and control determine the economy of pump selection.

The radial piston pump can readily be built to give variable volume; and there are a variety of volume control mechanisms.

If there is anything like a hierarchy in pumps, piston pumps are right at the top in performance. These positive displacement pumps generate high pressures, most models are rated near 3000 psi with some designs going as high as 10,000 psi. Deliveries range to 200 gpm.

Figures 1, 2 and 3 illustrate the operating principle of the Oilgear radial, variable delivery pump. As the cylinder is revolved around the stationary pintle, or valve spindle, by the action of some driving source, the double row of radial pistons reciprocate in the cylinder block. The amount of in and out motion is determined by the position of the slide block which alters the eccentricity of the reaction ring.

Referring to Figure 3, as each piston passes the point of minimum clearance between the cylinder and reaction ring, the piston moves outward to draw in oil from the upper suction ports. Passing the point of maximum clearance, the piston is forced inward to discharge oil through the lower pressure ports. When the outer reaction rotor is shifted so that its center coincides with the center of the pintle, the pistons will not reciprocate and the discharge will be zero.

By omitting the moveable slide block this pump becomes a constant delivery unit, with the output determined by the fixed reciprocating movement of the piston.

Distinguishing Feature

The various makes of radial piston pumps are very similar in operation. Perhaps the most distinguishing feature is the method of transmitting the reaction of the pistons to the outer rotor.

The simple one piece piston heads on the Oilgear pump are so designed as to cause the pistons to rotate as well as reciprocate. This slow rotation is necessary to adjust for a difference in speed between the piston heads and reaction ring, and their points of contact with the reaction ring. The difference in speed is caused by differ-

Rotary piston pumps are built in both axial and radial designs. Next month we'll discuss the axial type and then follow with Part 8 on reciprocating piston pumps.

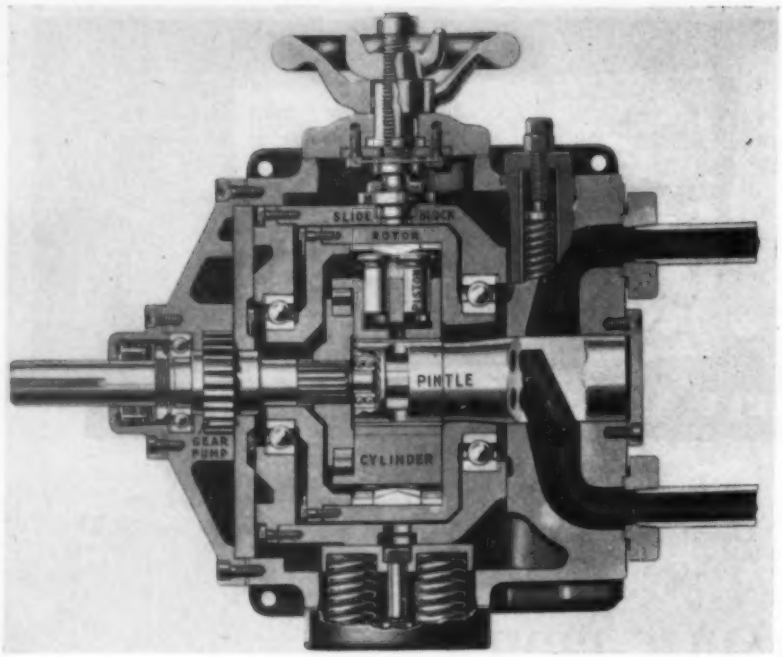


Fig. 1. This model of the Oilgear variable displacement pump uses handwheel control for changing delivery. The gear pump in the front housing is for operating the hydraulic controls and for partially supercharging the main system. Units are available for pressures to 3000 psi and capacities to 110 gpm.

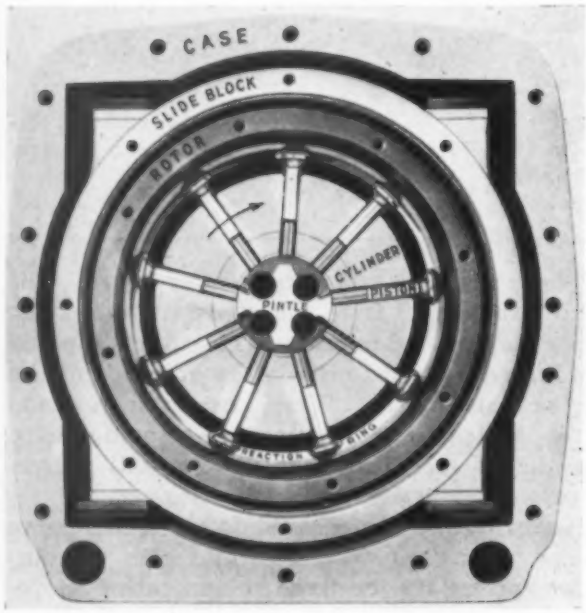


Fig. 2. In the neutral, no delivery position, the slide block, rotor and reaction ring unit have the centerline concentric with the cylinder, pintle and drive shaft centerline.

ences in radii from the center of the cylinder to the points of contact of the piston heads with the conical-reaction ring surface.

The selection of a control device for varying piston pump delivery is again dependent on application.

What devices can be used to move the slide block?

Obviously, handwheel, manual control as shown in Figure 1 is simple. The thrust of the handwheel is balanced by opposing springs. But perhaps we want to control our pump automatically, and at different points in our operating cycle we require changing volumes. We could replace the handwheel with a geared head electric motor which would turn the screw only when the motor was started by some remote push-button or by an automatic limit switch control. The electrical control may be replaced by hydraulic control using an oil cylinder to push the slide block into the proper position. Again, movement of the control cylinder may be arranged by manual valve or automatic solenoid valve control. The designer or application engineer has a wide choice of controls and may ingeniously combine several methods to give his desired results.

Figure 4 shows the design of the Hele-Shaw

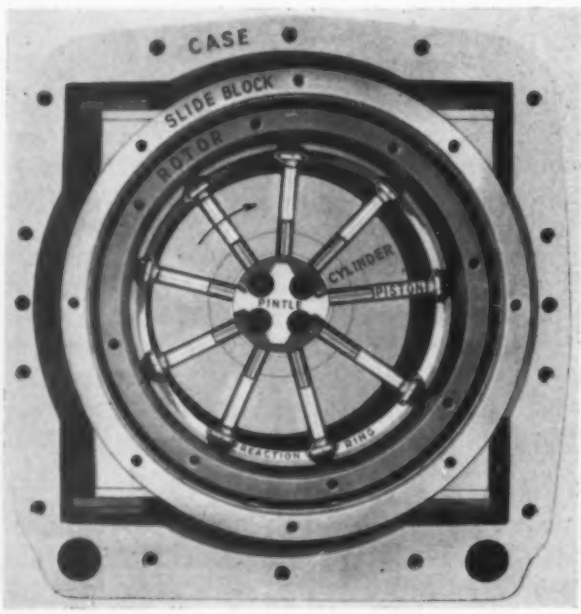


Fig. 3. When the slide block, rotor and reaction ring unit are shifted to the right oil is discharged through the lower ports. Discharge can be reversed by shifting these members to the left of centerline; oil is then delivered from the upper ports.

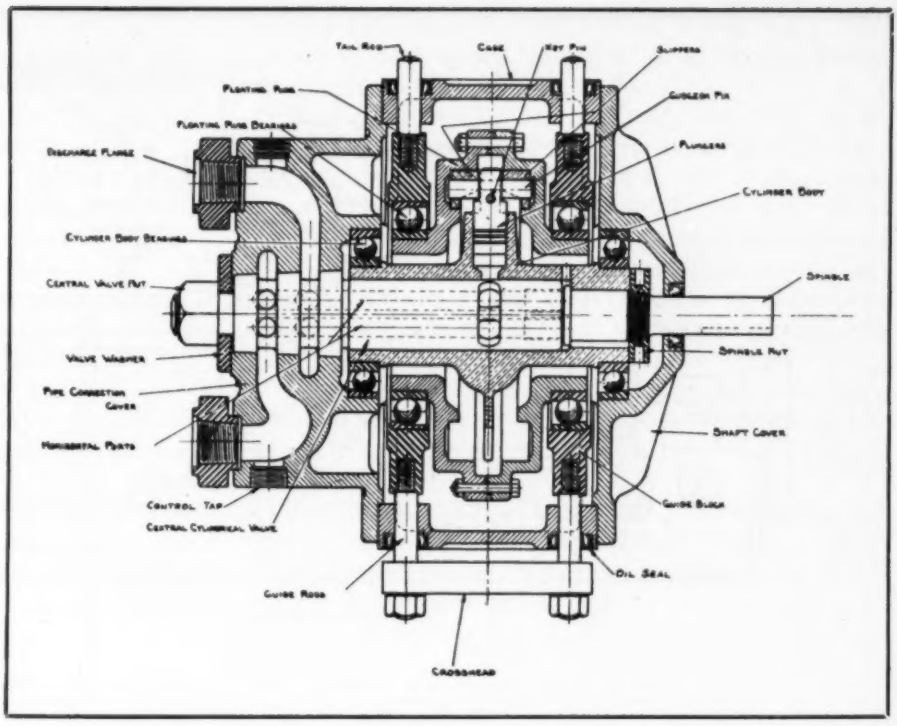


Fig. 4. The Hele-Shaw pump offered in a range of sizes to supply up to 150 gpm at pressures to 3000 psi uses a slipper mechanism at the end of each piston.

radial piston pump built by American Engineering Co. A pair of slippers which is mounted in the reaction rotor (floating ring) is fastened to the end of each piston by the gudgeon pin. Rotation of the floating ring on ball bearings is caused by the friction of the slippers as the cylinder body is turned by the drive shaft. Varying piston speed due to differences in radii are compensated for by the slippers.

Like the Oilgear pumps these units are rugged, heavy duty pumps.

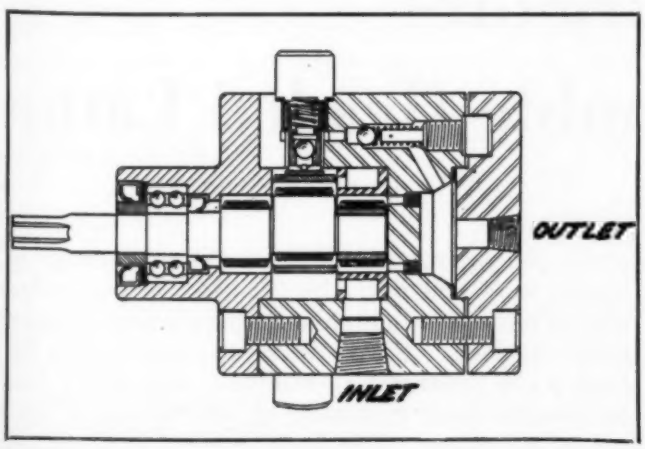


Fig. 5. Pressures to 10,000 psi at a fixed delivery of approximately 1½ gpm are made possible by this hollow piston design used in the Seco pump.

A third radial design is a very compact constant volume pump with delivery at pressures up to 10,000 psi, Figure 5. The cross-section drawing of the Seco pump shows the construction of one of the seven pistons which are equally spaced radially around the periphery of the pump body. Motion is transmitted to the pistons by an eccentric shaft, supported by needle bearings.

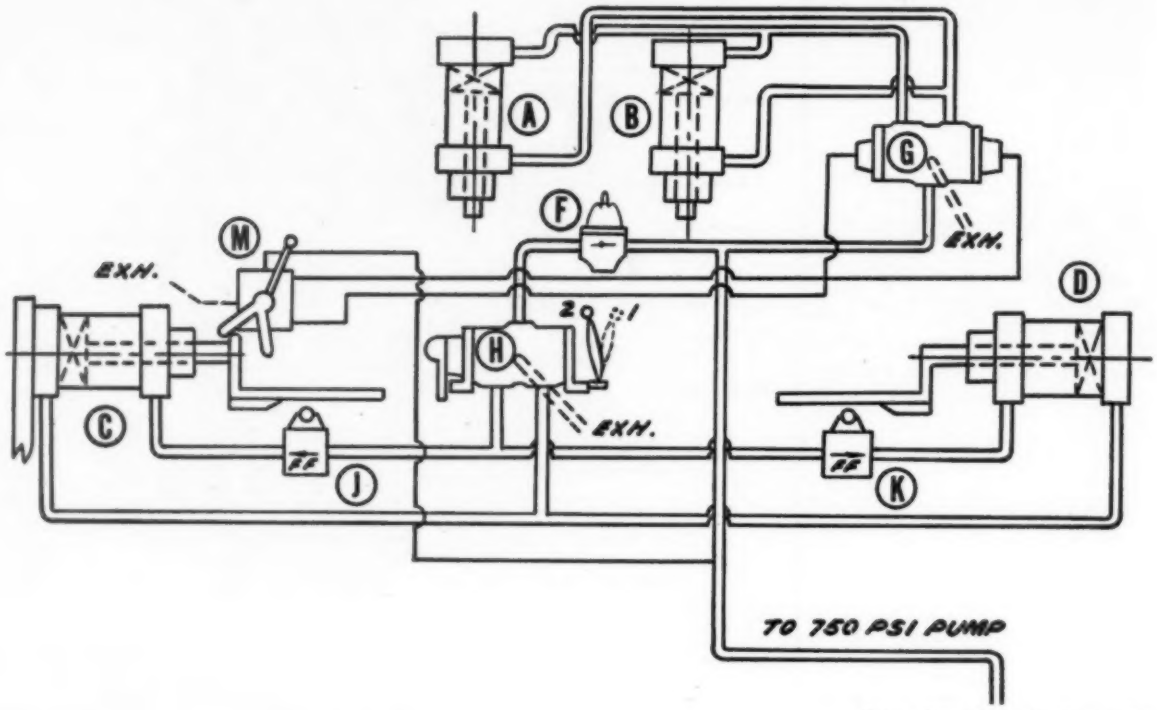
The small size and high generating pressure of this pump is made possible by the hollow piston design. Slip is a limiting factor for pressure; and slip is a function of clearances between the piston and cylinder wall. Using a precision ground, hardened tool steel, hollow piston, fluid pressure acts to expand the metal to give a tighter seal as pressure goes higher. A limiting factor in this design is frictional forces which would bind the pistons when pressures exceed the rated 10,000 psi.

In operation, oil from the inlet fills the piston as the piston moves down and the piston check valve opens. Oil is discharged through the discharge valve as the piston moves up.

Recently the American Engineering Company introduced the Hydramite, constant displacement, radial piston pump with its unique "Pendulum Action". This pump delivering up to 5000 psi and available in 3, 5, and 10 gpm sizes, uses a hollow plunger and porting arrangement which is similar to that shown in Figure 5.

The "Pendulum Action" employs a minimum of moving parts. Each of the seven pistons is held at its lower end by the special cylindrical socket type joint which is an integral part of each slipper. Each slipper is held against the bearinged eccentric hub of the drive shaft. As the shaft rotates, reciprocating motion is imparted to each piston. While each piston moves in a straight line motion, each slipper, because of the ball joint, moves back and forth along the drive shaft's contour like the pendulum of a clock.

The slipper distributes the load from the piston to the drive shaft bearing over a large area, to give longer bearing life with a minimum of wear and maintenance.



Data and Circuit Courtesy Logansport Machine Co.

A and B	Clamping cylinders 3 in bore, 3 in stroke	H	Latch type, hand operated, 2-position, 4-way valve
C and D	Boring bar cylinders 4 in bore, 3 in stroke	J and K	Cam operated speed control valves
F	Sequence valve	M	Trip dog operated 4-way pilot valve
G	Pilot operated, 2 position, 4-way valve		

Logic Called For Hydraulics On This Double Headed Lathe

CONVEYOR ROLLS MADE FROM STANDARD STEEL tubing, require a boring operation on each end to provide for the press fit of bearings. This job offers several tooling problems when high production must be maintained. Bored diameters are critical as to size and concentricity; depth of bore must be the same at both ends; and tubing often plays havoc with boring tools when feeds are not uniformly held.

To solve these problems, a new machine was designed having double spindle boring heads to machine both ends of the roll at the same time. Complete, automatic operation of the work holding devices and boring tools is accomplished with oil power.

Originally, the conveyor rolls were machined on a production lathe. Machining time on the lathe was too great, making it impossible to meet scheduled production. Considerable breakage of boring tools was also experienced. It was found that in one week as high as 21 blades were broken from the tools. Excessive setup time, which for each piece averaged 10 minutes, was partly due to changes made necessary by the variety of conveyor roll sizes. The rolls ranged in diameter from 1½ to 3 in, and in length from 5½ to 30 in.

With the new hydraulically powered machine, production went up to 100 pieces per hour with setup time of only two minutes.

Clamping force required to hold the tubes was computed to be 5000 pounds maximum and boring force 9000 pounds maximum. Two, 3 in diameter clamping cylinders are used, and the boring cylinders are 4 in diameter. Using these cylinder sizes, a hydraulic power unit capable of developing 750 psi provides the maximum re-

quired holding and boring forces.

The feed rate varies from two inches to five inches per minute depending on the size and toughness of the material. Boring feed is readily controlled by speed control valves.

To put the machine in motion, it is only necessary for the operator to shift control valve H. The machine goes through the complete clamping and boring sequence automatically.

During the stand-by period, cylinders A, B, C and D are in retracted position as shown in the circuit drawing. Valve H is in position 2 with latch released.

When the operator shifts valve H to position 1, pressure oil is directed to the blank end of the boring bar cylinders, causing them to advance. Almost at once, the trip dog actuates pilot valve M to reverse valve G, directing pressure to the blank end of clamp cylinders A and B, causing them to advance and clamp the work piece. While clamp cylinders are advancing, cylinders C and D are at rest, being "starved" of oil by the action of sequence valve F.

When the work piece is firmly clamped, built-up pressure again opens F, permitting oil to flow through valve H. Cylinders C and D then continue their "out-stroke", rapidly at first until straight line cams actuate valves J and K and then slowly at a feed rate determined by the setting of valves J and K. Cylinder C should be somewhat "later" than cylinder D to permit cylinder D to complete its "out-stroke" first.

Then when cylinder C completes its "out-stroke", the latch on valve H is released to reverse it and cause cylinders C and D to retract rapidly.

Near the end of "in-stroke", the trip dog actuates valve M, reversing valve G causing cylinders A and B to retract and release the work piece. All action ceases.

Size Flexibility Achieved With . . .

Pressure Loaded Embossing Rolls

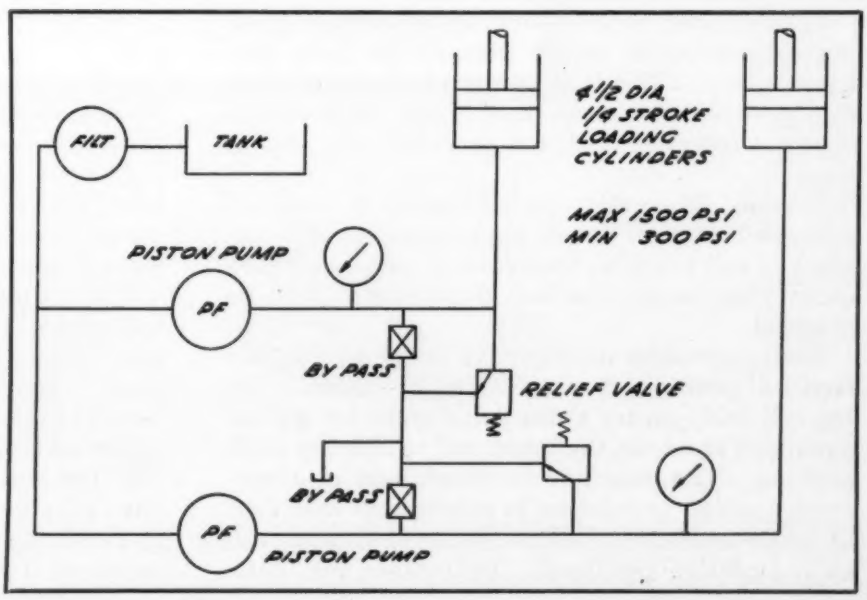
By AMBRO TODORAN

PROBLEM: Design and build a roll embossing machine for aluminum scuff plates to be used in automobiles. One machine must handle a range of plate lengths. Pattern lengths will vary from 27¼ to 44¼ in.

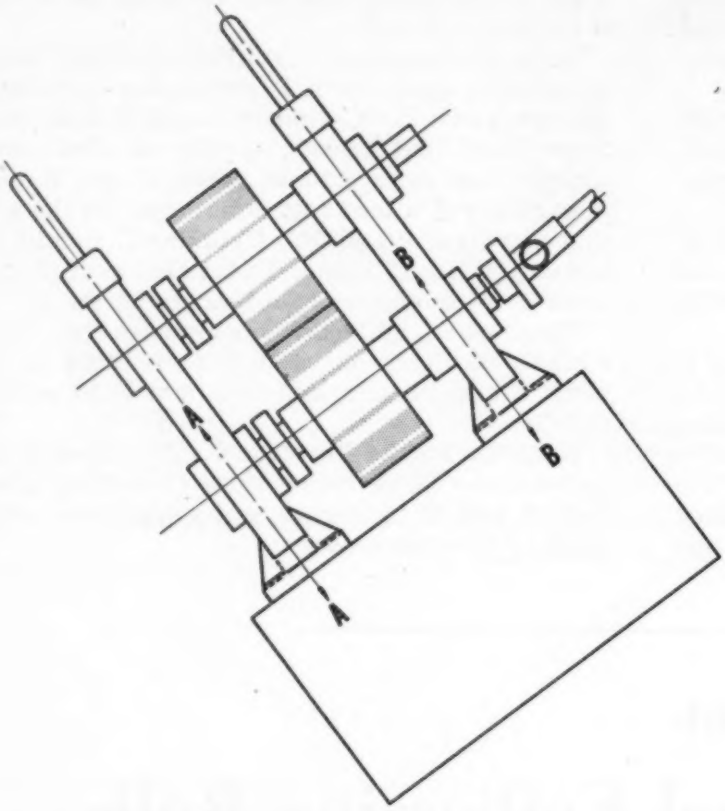
Embossing is to be done on a continuous aluminum strip from 7 in wide coil stock travelling through the rolls at a constant speed of 63 fpm for all pattern sizes.

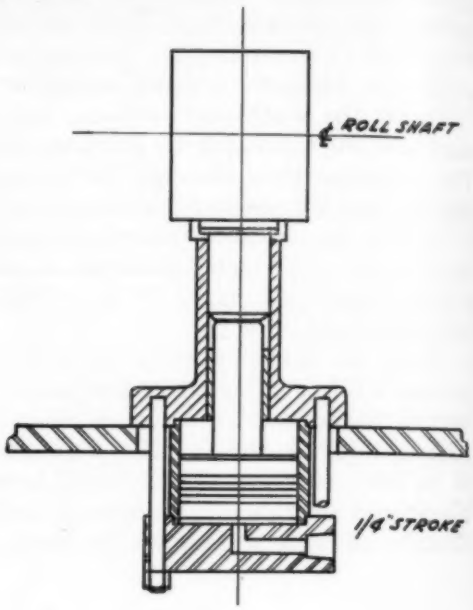
To insure proper embossing pressures, variable loading on the roll shaft bearings from 4700 to 23,000 pounds must be available. Control for

Ambro Todoran is a design engineer with The Yoder Company, Cleveland, Ohio



Pressure between the top and bottom rolls is controlled by oil cylinders built into the end castings. Each cylinder is controlled independently by adjusting the relief valves. The lower roll is dropped when the cylinders are drained by manually opening the bypass valves.





Section A-B through a loading cylinder. By changing the length of spacer plug between the roll and cylinder rod, different diameter rolls are accommodated.

loading each bearing separately is essential to obtain a uniform depth of impression on the stock due to the pattern not being located in the center of the stock. Uniform loading is maintained despite variations in stock thickness.

Having these mechanical requirements, engineers at the Yoder Company, Cleveland, set about to develop an efficient production machine which could readily produce the varying scuff plate sizes with a minimum of set-up time and with a simple means of loading the rolls.

They decided to use a hydraulic pressure loading system which would literally be built into the machine. This loading system does not alter the appearance or clean lines of the machine and does not interfere with the procedure for changing rolls.

To most efficiently use the stock, a complete embossed pattern takes approximately 355 degrees of roll rotation, therefore, to produce treads of varying length, the roll diameters had to be changed.

Giving consideration to coil stand height and feed roll position, it was decided to maintain the top roll shaft center at the same point for all roll sizes; and to adjust the lower roll to this top shaft position. The pass line is maintained in a constant position in relation to subsequent machines by adjusting screws which locate the upper roll in its relative position. The bottom roll automatically comes into correct position by use of the hydraulic cylinder.

Installing a ¼ in stroke oil cylinder in the base of each side casting provides the solution to roll loading.

Three different diameter rolls; 8.69, 12.14 and 14.10 in are used. Their respective speeds, to give constant stock travel, are supplied through an electro-mechanical variable speed drive.

Spacers Position Lower Roll

Adjustment of the lower roll is obtained by placing spacer plugs of various lengths on top of the hydraulic platen as shown in Section A and B.

Two small pumps with specially lapped pistons, are driven directly from the roll shaft to supply pressure oil in small quantity to the loading cylinders.

The hydraulic system is quite simple. Relief valves are adjusted to properly load each bearing independently as indicated by the pressure gages. Manual by-pass valves permit draining the cylinders to drop the lower roll.

Standard 4½ in diameter cylinders are used. The rod end caps were removed and the base of the roll stand casting was machined to serve as the end cap. Section A and B shows the installation of the cylinders in the roll stand.

"COMMERCIAL" HYDRAULIC PUMPS

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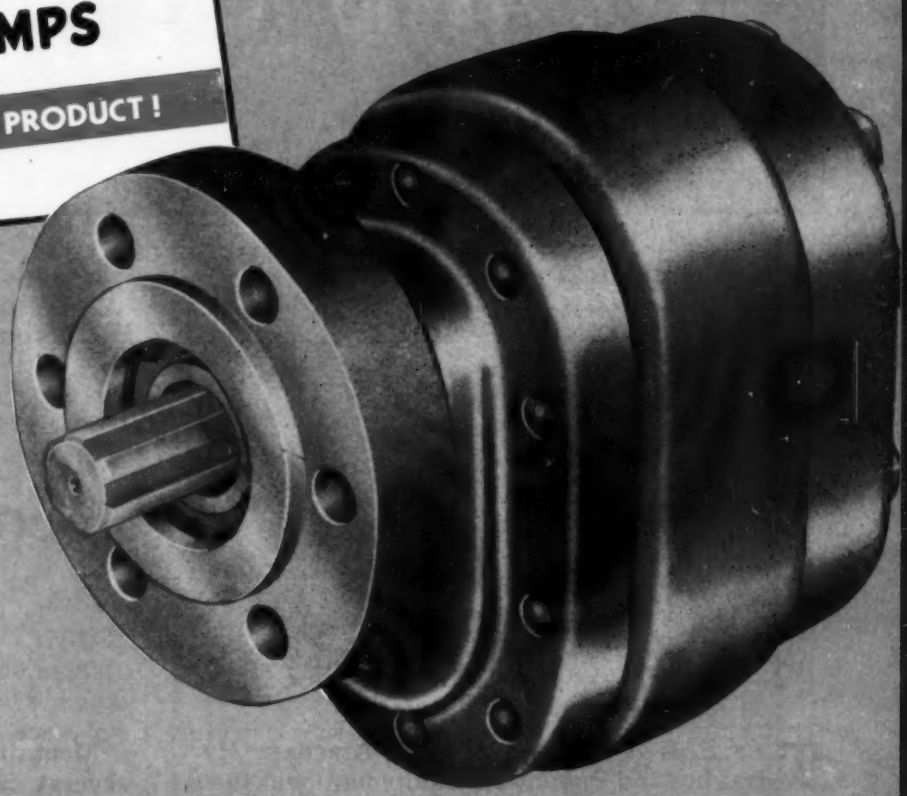

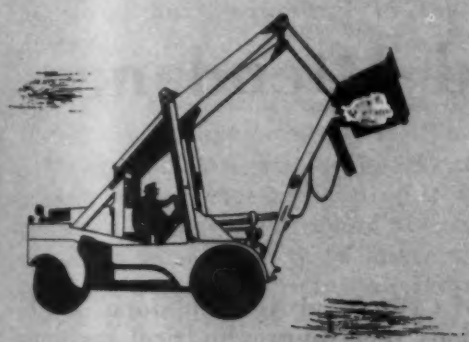

Thousands of "Commercial" hydraulic pumps operating under pressures up to 1500 p.s.i. develop greater output discharge per horsepower input.

The specially developed tooth contours of the gears in these pumps are ground by us to tolerances much closer than can be obtained on gear grinding equipment commonly used in this country. Such precision is one of several important factors which have increased the efficiency of the "D" series pumps to well over 90 per cent. You, too, will want to benefit by the savings these quality pumps are giving because they do—

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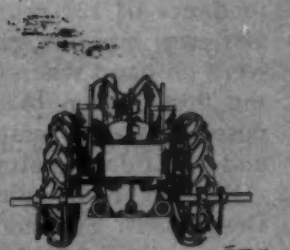
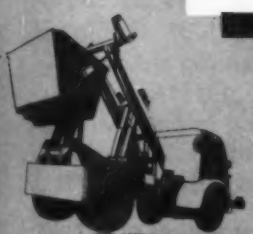
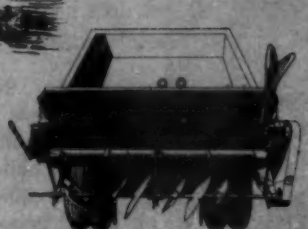






THE COMMERCIAL SHEARING AND STAMPING CO. YOUNGSTOWN 1, OHIO

RALPH E. MIDDLETON
Advisory Editor

A-6 Meeting Draws Record Attendance

THE SAE A-6 COMMITTEE ON AIRCRAFT HYdraulics and Pneumatic Equipment held their regular semi-annual meeting at the Van Cleve Hotel, Dayton, April 25, 26 and 27. A record attendance of 125 representatives of the Services, airframe builders, manufacturers and suppliers were on hand when Chairman B. R. Teree called the first session to order. The Committee disposed of an unusually heavy agenda in its two and a half day meeting.

Size of Hydraulic Reservoirs: J. C. Bloom, Douglas, El Segundo, reported on his reservoir survey (SAE-A6-42) which indicated that Class II reservoirs would be retained. Discussion on a point raised by R. P. Lambeck, Hamilton Standard Division regarding the relation of reservoir size to pump capacity indicated that this relationship was not the prime consideration in determining reservoir size.

Mounting of Cylindrical Accumulators: While several questions regarding cylindrical accumulators (MIL-A-5498) were on the agenda—gun fire test requirements, precharges required and capacities for both oil and air—the main discussion developed around the advisability of end mounting points and type of air end boss of the AN envelope drawing. It was agreed after considerable discussion that the end mounting was often desirable. It was recommended that the envelope drawing be changed to provide for either end boss or band (clamp or strap) mounting.

In-Line Relief Valve: This type valve (MIL-V-5523) is growing in acceptance by aircraft builders due to the space saving possibilities. As J. C. Bloom pointed out there are still low temperature difficulties that must be eliminated and he urged that component manufacturers accelerate

Representatives of component manufacturers, government agencies and airframe builders met at the semi-annual SAE A-6 Committee meeting.

efforts toward getting approval. (This type valve was discussed in the March 1951 issue of APPLIED HYDRAULICS, "Inverted Relief Valves in Aircraft" by Howard F. Schmidt).

High Temperature Hydraulic Fluids and Packings; The Identification of "O" Rings; and Non-Flammable Hydraulic Fluids: These items were reported in the Technical Advisory Committee meeting.

Brake Subcommittee Report

C. E. Deardorff, Pacific Division, Bendix Aviation Corp., reported on the changes suggested by West Coast members of his subcommittee on three specifications.

Power Brake Valves: On this spec (MIL-V-5525) a number of changes were presented and approved for resubmittal to the airframe industry.

Aircraft Wheel and Brake Assemblies: A number of changes recommended in this spec (MIL-W-5013) were approved for similar action.

Design of Aircraft Brake Systems: Recommendations on revisions to this spec (AN-B-2) centered around the problem of excessive heating of oil on second and third brake applications on landings. Further study and possibly some redesign was indicated.

New Pneumatic Subcommittee

Perhaps the most important development at the A-6 meeting was the appointment of a pneumatic subcommittee by Chairman Teree.

Al H. Hobelmann, Walter Kidde & Co. was appointed temporary chairman; other members include J. W. Kelly, Adel Division, General Metals Corp.; Michael Caserta, M. C. Mfg. Co.; L. A. Carlson, Westinghouse Air Brake Co.; N. L. Cornelius, Cornelius Co. and Carl Strid, General Controls Co.

Mr. Hobelmann reported that BuAer had made arrangements with the Bureau of Standards to conduct a series of basic tests on pneumatics. Joseph Hilsenrath of the Bureau will be in charge of the BuAer program. He also reported that Harold E. Wells, Bell Aircraft Co., would continue on his pneumatic survey.

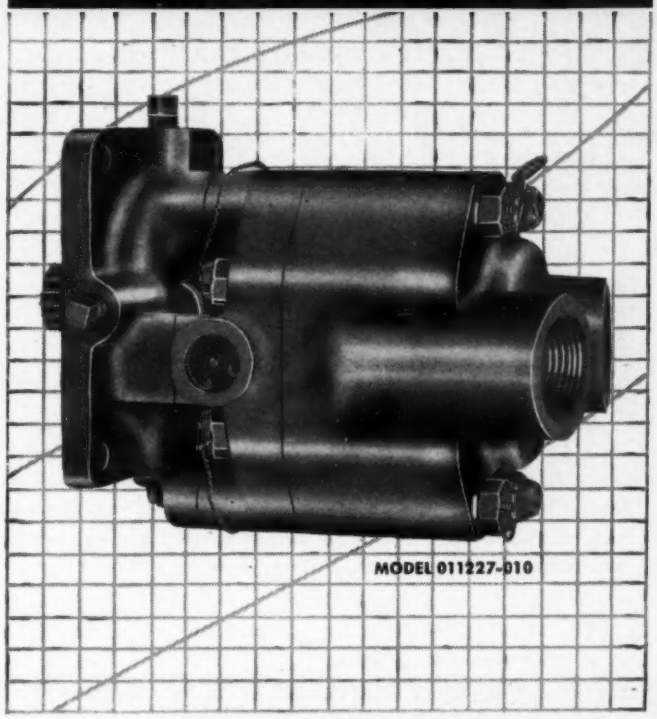
The most important pneumatic item on the agenda was the general MIL-P-5518 on the design installation and tests of pneumatic systems in aircraft. In addition two items on valves were discussed.

Pneumatic Systems, Design Installation and Tests in Aircraft: Fred H. Pollard, Republic Aviation Corp. and A. H. Hobelmann requested the Committee to select the order of preparation of detail specs from a list of pneumatic system components. After some discussion by manufacturers and airframe engineers it was agreed that the first three component specifications should be:

(Concluded on page 56)

Circle 3 on Reader Service Card

LOOK AT Pesco
performance charts FIRST



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- High capacity—3 g.p.m. at 1500 r.p.m., at 3000 p.s.i.
- High volumetric efficiency—96% at 2500 r.p.m., 3000 p.s.i.
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"Pressure Loading" which provides automatic compensation for wear on the bearing and gear running surfaces makes possible high efficiencies and long, trouble-free service life.

This pump has been service tested by several leading airlines and has operated, well in excess of 3000 hours, with no maintenance except recalibration and replacement of shaft seal diaphragms at engine overhaul time.

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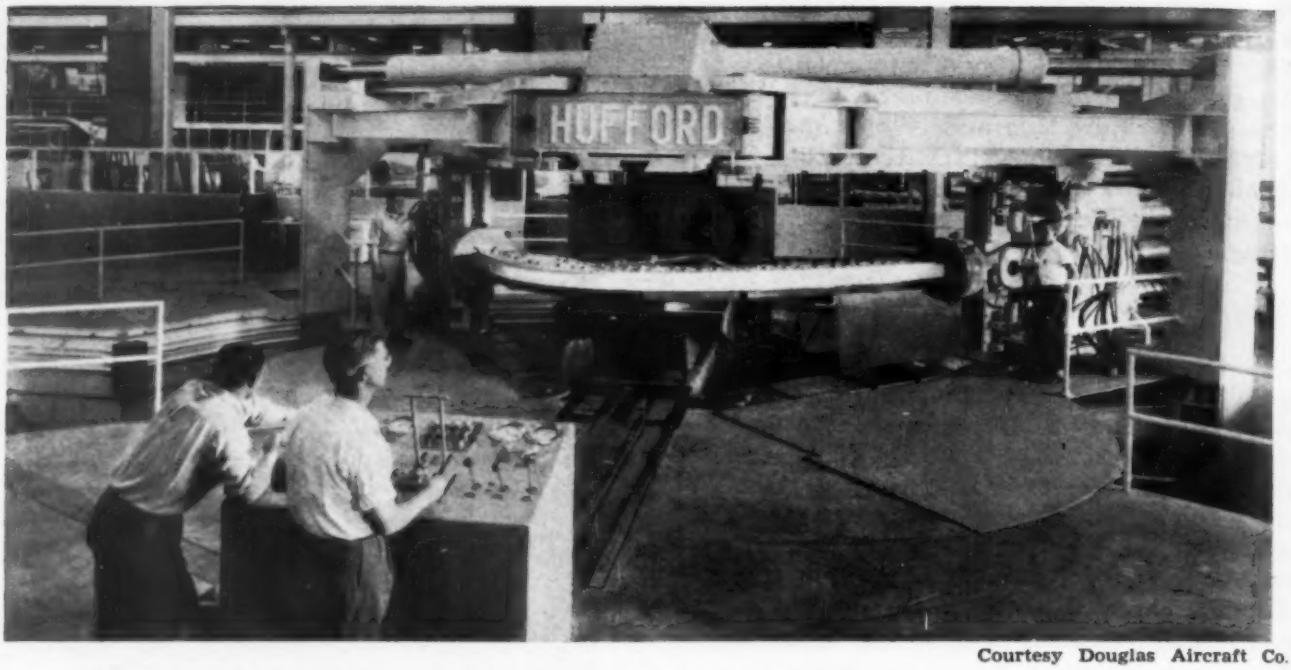


Courtesy Douglas Aircraft Co.

From his remote station the operator controls the hydraulic cylinders which clamp, wrap, stretch and form the airframe member. Oil power gives accurate tension control and flexibility of movement. By eliminating many secondary operations, such as, heat treatment and straightening, and by producing wrinkle-free parts with large savings in time, this • • •

Giant Machine Meets Defense Schedules

By J. A. HELGET

ENGINEERS AT THE HUFFORD MACHINE WORKS, Inc. put more than 175 hydraulic horsepower into this stretch-wrap forming machine to produce the many complex curvatures in airframe skin surfaces and structural members.

Flexibility of control as well as ability to handle many different pieces has been stressed in this design.

To set up the machine, a selector valve, mounted on the side of the frame near the rear of the machine is used to position the die box.

When the sheet width varies from the maximum 72 in, the gripping width may be shortened by omitting the unused outer jaw segments from the circuit. This is done through the use of needle valves on the back and top of the jaw, which prevent the unused jaw gripper segments from being activated. Over-all control of segments is provided by a selector valve mounted on the side of each jaw.

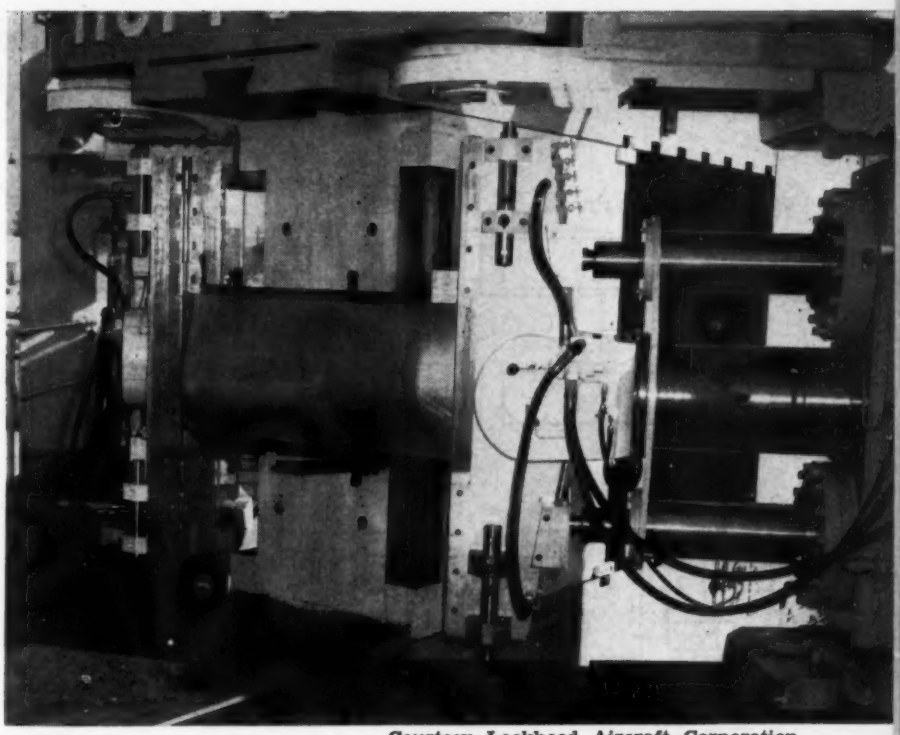
The length of the sheet determines positions of the tension cylinder assemblies on the arms. The tension cylinder assemblies are moved by fixing the position of the jaw by engaging the jaw keys into slots in the arms and then using the tension cylinders to move the tension cylinder housings to the correct positions. The jaw keys are then disengaged and tension cylinder housing keys are reengaged in the proper slots.

With the arms in the full forward position, a sheet of material is placed in the jaws and jaw gripper segments closed by actuating the selector valve on the side of each jaw. The material is now securely gripped between the two jaws of the machine.

With the actuating cylinder selector valves placed in the neutral position, the material to be

J. A. Helget is General Manager of Hufford Machine, Works, Inc., Redondo Beach, Calif.

Under tension, between the jaws the sheet becomes semi-plastic to conform to the die shape. Giving final set to the work stretches it beyond the material yield point to achieve a gain in strength.



Courtesy Lockheed Aircraft Corporation

formed is given an initial stretch. This is done by placing the two stage pressure control valve in the low pressure position and actuating the tension cylinders. The tension cylinders on each assembly apply the load through a torque tube that supports a sheet jaw.

Material is now wrapped by energizing the actuating cylinder valves. This causes the hinged arms to move backwards, wrapping the material over the die while maintaining the tension. The final set is produced in the material by shifting the two stage pressure control valve from the low to the high position.

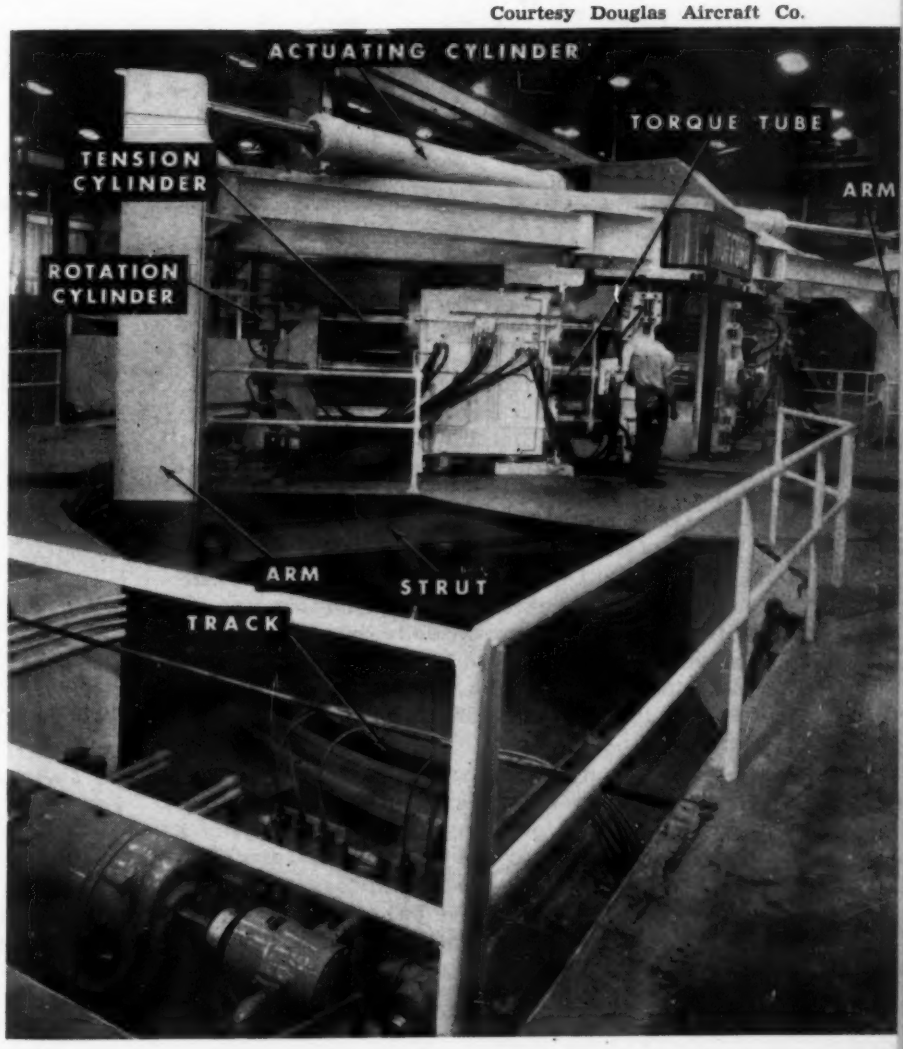
Each arm is independently actuated on the track by a pair of cylinders. Two actuating cylinders are clearly seen at the top of the machine. Two more pull on the lower ends of the arms.

After the material has been removed from the jaws, the arms are returned to the forward position and the cycle is repeated.

If in the sequence of operation, the tension cylinder has been rotated, it may be realigned parallel with the arm by actuating the straightening cylinders in the proper direction.

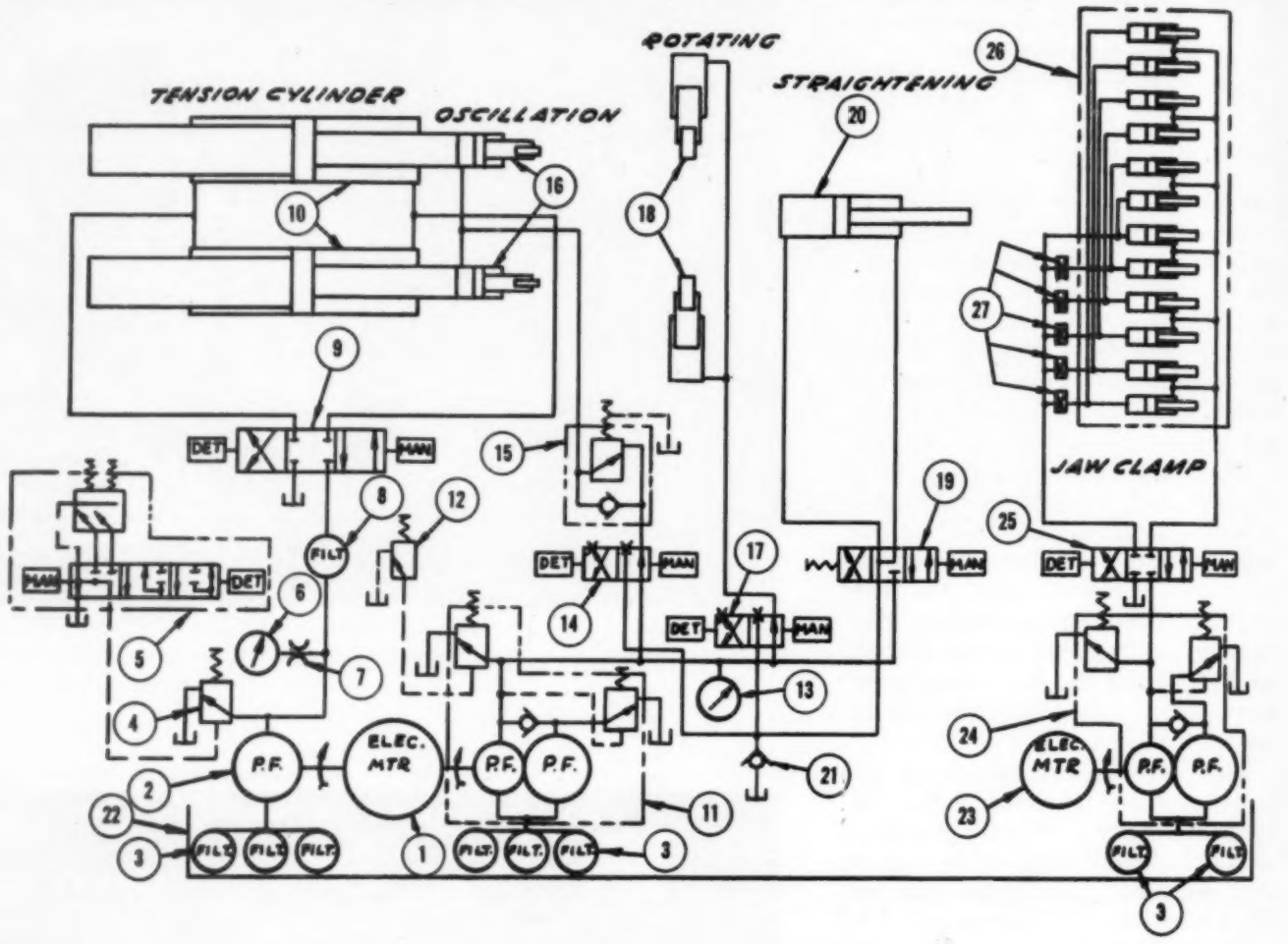
Oscillation cylinders mounted on the inboard tension cylinder rods are used to straighten the jaw should it be cocked in the longitudinal plane during the forming of the part. Permitting the jaws to rotate and oscillate, within limits, during forming, relieves stresses.

Courtesy Douglas Aircraft Co.



The 25 hp hydraulic power supply at the bottom left, powers all movements on each tension cylinder assembly. Two additional 50 hp units are located in the rear of the pit for actuating arm travel.

Circuit Design for Stretch-Wrap Forming Machine



Tension Control And Jaw Clamp

To get the required pull for stretching the work, two tension cylinders are needed on each jaw. The 17 cylinders shown in the circuit power the motions of one jaw. Similar cylinders are mounted on the opposite jaw. The complete circuit is shown for one jaw; the same power units are used to supply pressure oil to the second jaw.

Oil is supplied from a 680 gallon reservoir. The tension cylinders are powered by oil from vane pump 2 which has a maximum rated delivery of 44 gpm at 2000 psi and is powered by a 75 hp, 1200 rpm motor. This motor also drives double pump 11 which powers the rotation 18, oscillation 16, and straightening 20 cylinders.

At maximum pump pressure, the tension cylinders will give a pull of over 200 tons to set the work. Maximum tension is controlled by the setting of relief valve 4 which is remotely controlled from valve 5.

Of particular interest, is the special two stage pressure control valve 5. This valve located at the control panel allows selection of two preset pressure settings; one for the initial stretch and one for the final setting stretch. Valve 5 is shown in neutral; the pump volume is unloading at near atmospheric pressure.

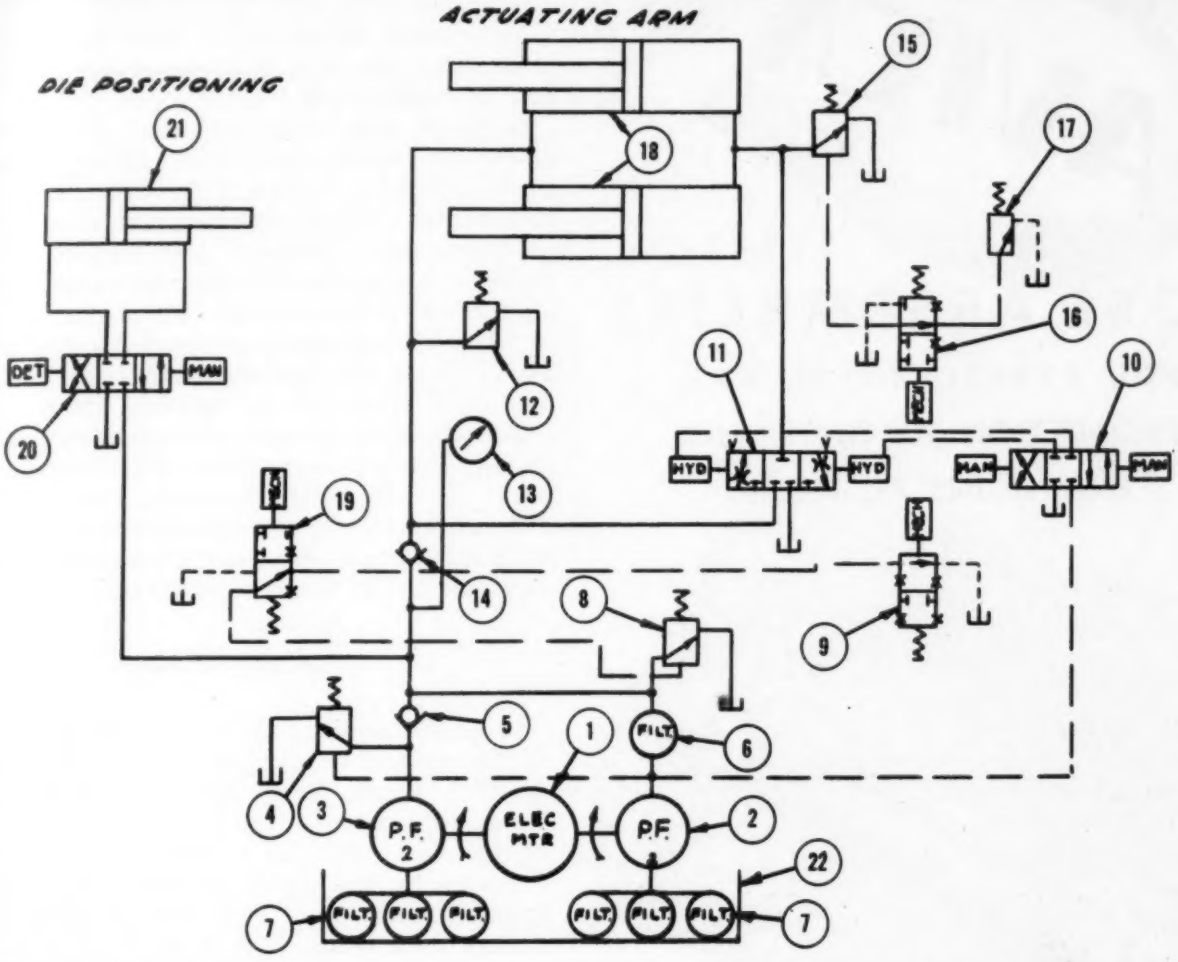
Oscillation cylinders 16 provide a fixity up to 650,000 inch pounds to straighten the jaw should it become cocked during forming. Resistance valve 15 is set to keep the jaw from rotating downward when valve 14 is in the free float position. Rotation cylinders 18, controlled by valve 17, provides for the centering or free float of the sheet jaw; supplying a fixity of 150,000 inch pounds to center. The blocked ports in valves 14 and 17 makes possible the free float position for the rotation and oscillation cylinders.

Straightening cylinder 20, allows the tension cylinder housing to be aligned as desired with the arm.

Double pumps 11 and 24 are used to give rapid travel to their utilities when under small load and then to give low volume, high pressure working power.

Actuating Cylinder and Die Box Circuit

The two large arms which swing on tracks to wrap the material around the die are each moved by two actuating cylinders. There are two power units required for the arm actuating cylinders, one for the two right hand cylinders and one for the two left hand cylinders. Only one die positioning cylinder circuit (19, 20, 21) is required. This is connected to the left hand power unit as shown in the circuit opposite.



A differential area circuit is used to power the arm actuating cylinders. The retracting force, 151,000 pounds at 2000 psi is acquired by draining the head end of the cylinder, and the effective retracting area is the bore area minus the rod area. The extending force, 94,000 pounds at 2000 psi, is acquired by having the same pressure on both sides of the piston head, and effective area thus becomes equivalent to the piston rod area of the actuating cylinder.

Stretch-Wrap Forming

1. **Jaws grip the sheet.**
2. **Tension cylinders stretch the work tangent to a stationary die-face.**
3. **Actuating cylinders wrap the part around the die.**
4. **High pressure oil to the tension cylinders gives the final set in the work.**

Pump 2 furnishing 36 gpm at 2000 psi and pump 3, 36 gpm at 1000 psi, are driven by a 50 hp, 1200 rpm motor. When system pressure exceeds 1000 psi, remotely controlled valve 4 unloads pump 3 at near zero pressure. Relief valve 8, which is remotely operated by pilot valves 9 or 19 unloads the pumps during no-work periods.

Pilot valve 9 is operated by a cam on the spool of valve 11. When this spool is in the center position, valve 8 is vented through pilot valves 19 and 9 to unload the pumps. Actuating valve 11 in either direction, closes valve 9 to allow the relief valve to relieve the pump at maximum pressure setting only.

The special flow control valve 11 controls the direction and speed of the actuating cylinders. Each of the two lands of the valve spool has tapered depth grooves parallel to the spool axis that increase in length around the circumference. Movement of the spool increases port size by uncovering more grooves to control the flow of oil to the cylinder.

Check valve 14 prevents extension of the actuating cylinders, caused by tension cylinder action. When the actuating cylinder system is in the unload position, rod end of actuating cylinder would be open to tank through unloaded relief valve 8 except for this check valve.

When the die must be positioned during set-up of the machine, pilot 19 closes the pilot circuit from relief valve 8 in order to restore full system pressure for moving the die positioning cylinder 21. It is normally open to allow the proper function of pilot valve 9, but when selector valve 20 is operated, a cam closes pilot valve 19.

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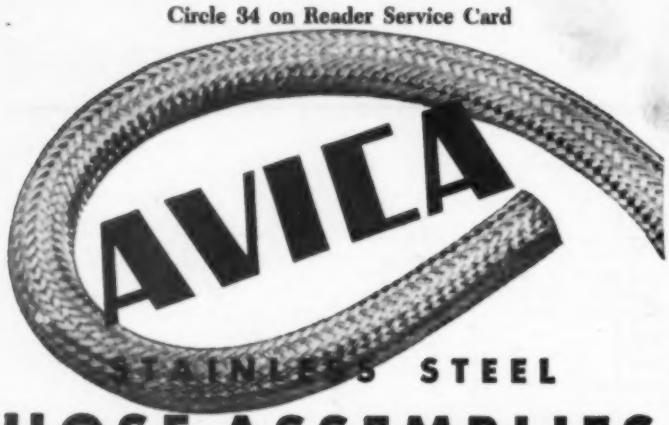

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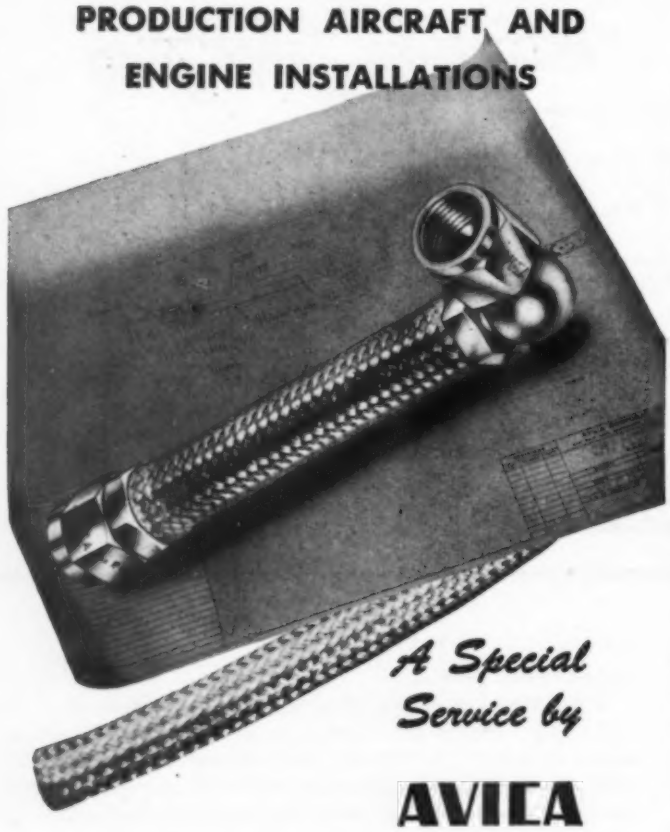

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SAE A-6 Meeting

(Concluded from page 51)

(1) pneumatic reservoir for both 1500 and 3000 psi storage pressure; (2) pressure reducing valve; and (3) relief valve.

Ralph E. Middleton, Lockheed Aircraft Corp., gave a brief status report summarizing work done since his similar report at the last meeting. He distributed a chart which represented the test progress made. Dwight E. Leach, Chance Vought Aircraft, brought up for discussion the 3000 psi air control valve, which has been in use for several years on emergency air systems. Ensuing remarks developed the fact that both bleed and non-bleed types are of general interest. Mr. Leach accepted the job of conducting a survey among airframe companies to determine practices. Fred H. Pollard's request to the AMC for a status report on pneumatic lubricants, reported in the Technical Advisory Committee meeting, was repeated to the A-6 meeting.

Miscellaneous Items

Several miscellaneous items of general interest were discussed. Among these were: (1) a request by R. C. Bumb, North American Aviation, Inc. for manufacturers to mark design changes with adequate identification or new part numbers; (2) a request by M. Caserta for data on demands for boosters, since they have power priority over compressor operation; (3) a request for status on stainless steel tubing fatigue tests; and (4) a request for an increased leakage rate in the 3000 psi selector valves AN 6392 and 6394. These were agreed on or disposed of: (1) the filter housing, which Mr. Bumb specified, is now being marked satisfactorily by the manufacturer; (2) airframe engineers considered the booster and compressor power loads as an installation problem; (3) Douglas, Santa Monica, has just received an AMC contract to conduct such tests; and (4) the Committee agreed that leakage rates of sizes -4 and -6 selector valve were satisfactory but that size -8 leakage should be increased to 2 drops and size -12 to 4 drops and Chairman Teree directed J. W. Jelly of Adel to make the changes in the specs.

Representing the Services were Harold Berke, Jack Prete, Mr. Bartholomew and Lt. Christianson of AMC; Leo M. Chattler, F. F. Jacobs, Mr. Davidson and Mr. Sanflippo of BuAer and A. H. Oshiver, Naval Air Experimental Station. R. N. Stickney, as usual, represented Aeronautical Standards Group. William E. Beckerle of the SAE aeronautical staff acted as secretary of the meeting.

Chairman Teree announced the appointment of two new members to the A-6 committee: Duncan B. Gardiner of Vickers, Inc. and Harry Cornish of Douglas Aircraft Co., Inc., El Segundo.

Aircraft Pump Committee Meets

SAE Committee A-1, Aircraft Pumps, under the chairmanship of J. Milton Kidd, Glenn L. Martin Company, held their regular semi-annual meeting on Tuesday April 24 at the Van Cleve Hotel, Dayton. Approximately 80 men, a record attendance for this Committee, were on hand.

Variable Delivery Pump Specification: After W. R. Beckerle of the Aeronautical Department, SAE, reported on the status of this spec at the ASG, Carl L. Sadler, Sundstrand Machine Tool Company, detailed the proposed pulsation test for variable delivery pumps, which he had suggested at the last meeting. Duncan B. Gardiner and Kenneth Postel of Vickers, Inc., reported on the type of cut-out valve to be used in the pulsation test set-up and on the Vickers pump data on the amount of torque pulsation which occurred in the drives.

Electric Motor Standardization: At the invitation of Chairman Kidd, R. P. Loveland of the General Electric Company and Chairman of SAE Committee A-2, Motor Standardization Panel, attended and went over in detail the features of motor standardization relating to electrically driven pumps. He gave particular attention to mounting flanges and horsepower ratings of the proposed standard electric motors. He pointed out that requests from airframe builders for some special motor configurations for wing mountings, for example, were creating serious problems in cooling and in special pad requirements.

Torque Capacities of Engine Pads: Mr. Sadler reported on the coordination with the Engine Committees regarding the increase in allowable torque of standard pump drives on the engines. Mr. Postel, who had requested discussion on this

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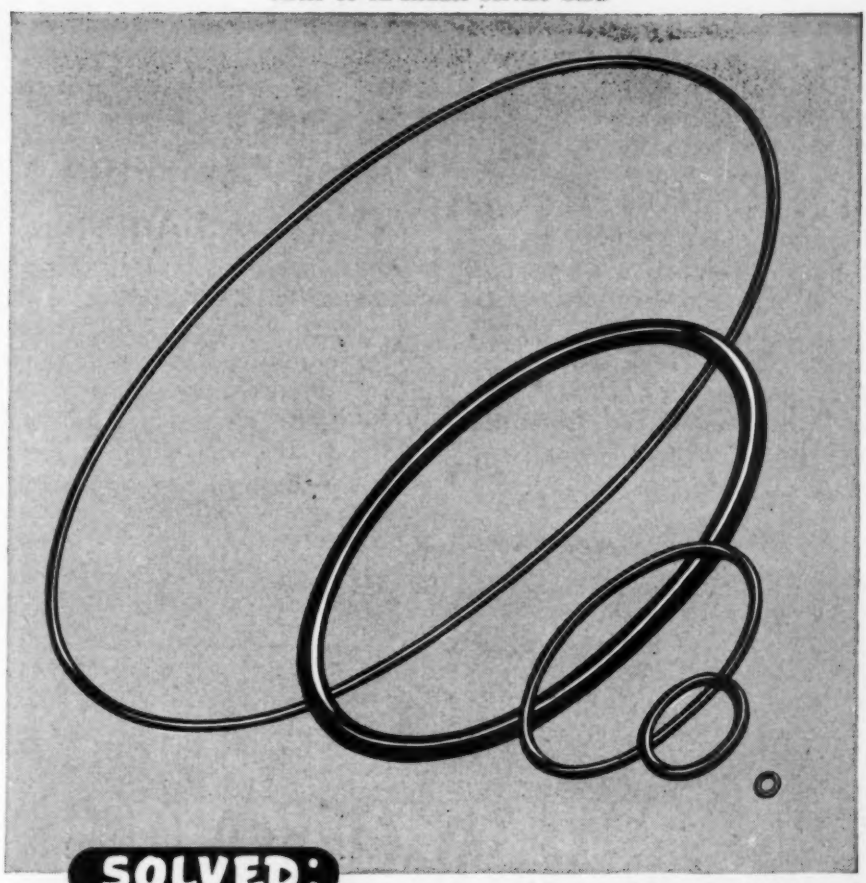

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item, reported that many Vickers pumps can readily be fitted to pads whose ratings are far short of the required driving torque and requested consideration for a higher torque capacity on the engine drives. Dwight E. Leach, Chance Vought Aircraft, reported briefly on new data on fatigue of pump couplings.

Chairman Kidd announced the appointment of two new members to the A-1 Committee: J. J. Murray, Thompson Products, Inc., Cleveland and John Marshall, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

A-3 Committee Meeting

CHAIRMAN L. J. HENDERSON of SAE Committee A-3, Aircraft Valves, Fittings and Flexible Hose Assemblies and his committee met with over 70 interested representatives of industry and the Services.

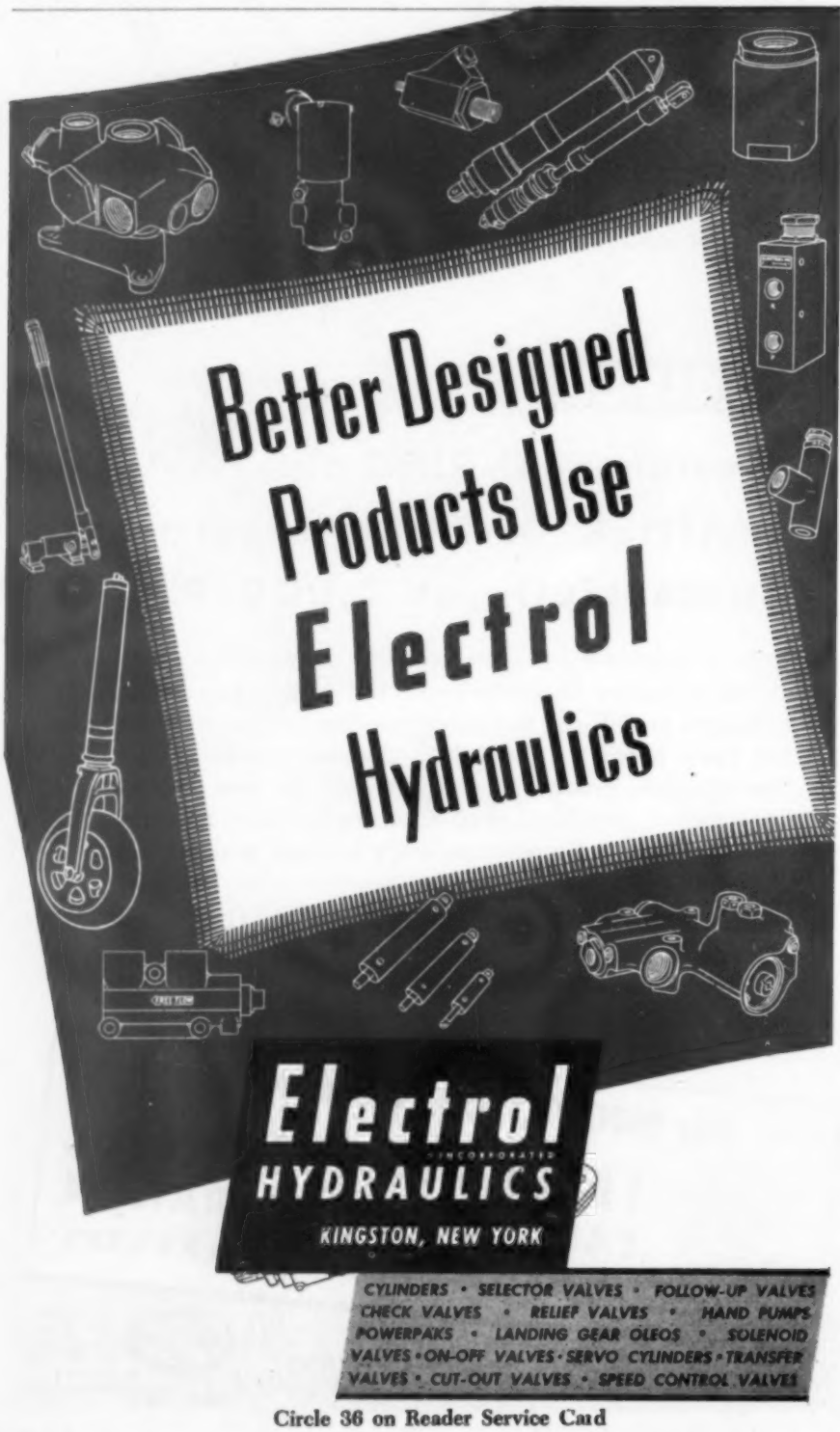
AN Tube Fittings: Mr. Fitzpatrick, chairman of the subcommittee on large sizes reported on the status of these items and J. C. Bloom of Douglas, El Segundo, presented a request for relaxing certain dimensional tolerances on AN tube fittings.

AND 10086 Design Standard Sheet: R. W. Phillips, Weatherhead Company, reported on a test of flange fittings using an "O" ring placed in a groove in the face of the boss. Norman F. Rooke, Pratt & Whitney Aircraft, reported on the progress made by the engine manufacturers with their proposed fittings. E. C. Johnson reported on the status of the drawings on the flange hose ends to be used with "O" rings and flat gaskets.

Aluminum Male End AN Fittings: J. C. Bloom, Douglas, El Segundo, presented data which indicated that aluminum male end AN fittings can be used satisfactorily with steel tubing in the small sizes without damage to the cone of the fittings.

Unified Threads: Lee Schmohl, Parker Appliance Co., reported on the SAE A3-91 survey. This item was thoroughly discussed and general agreement was reached by the airframe builders, fitting manufacturers and the Services. Some coordination remains with the engine manufacturers.

MIL-H-5511 Hose; Aircraft Hydraulic, Pneumatic, Fuel, Oil and Coolant Resistant: R. W. Phillips, Weatherhead Company, reported on the progress of a fire test which is to be placed in this spec. Considerable discussion was developed on the change to paragraph I 3-b of this spec as a result of a survey (A3-94) covering the age of hose that can be furnished to the Services. A limit of 12 months was proposed for age of hose at time of expected installation.



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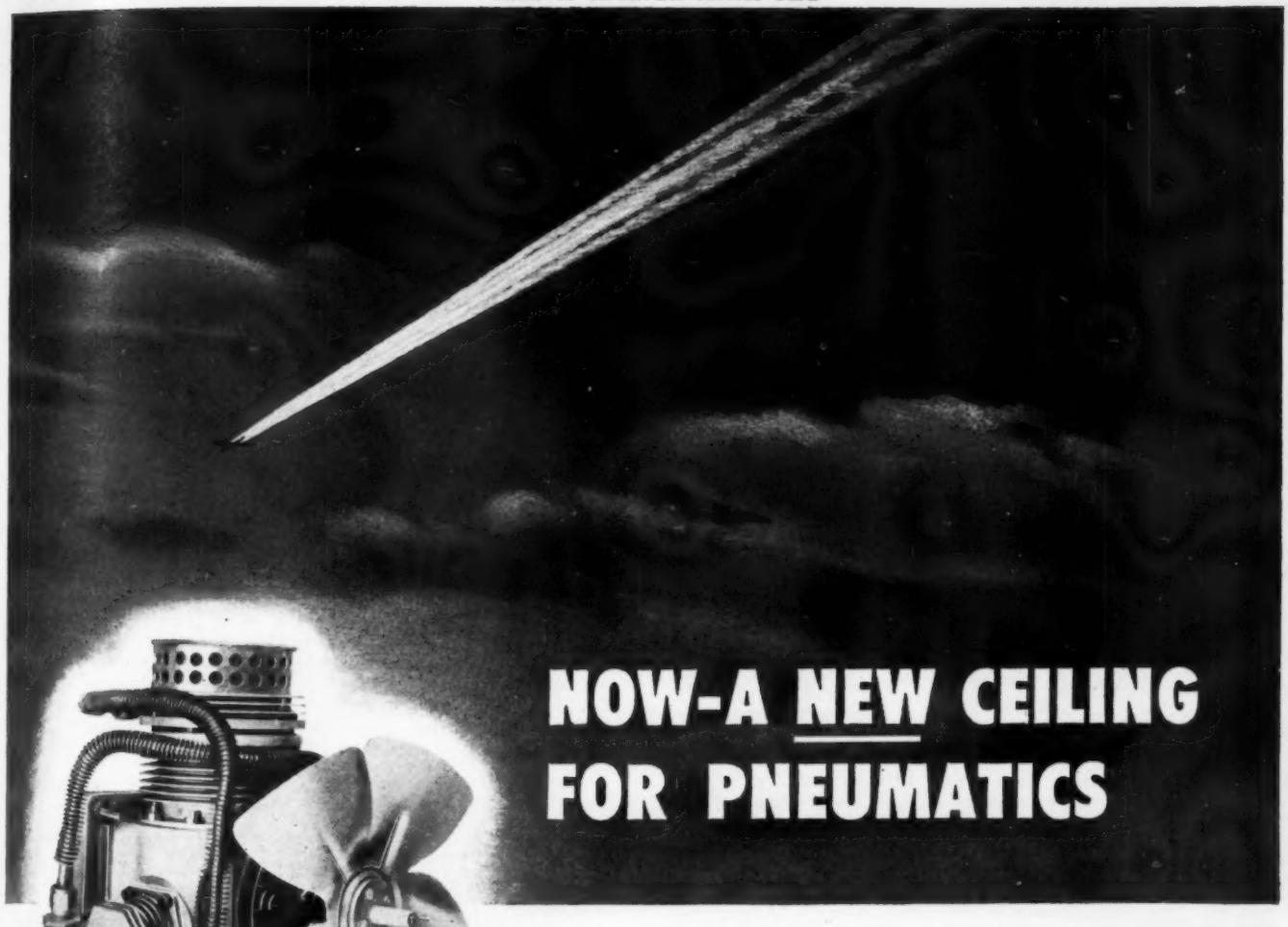
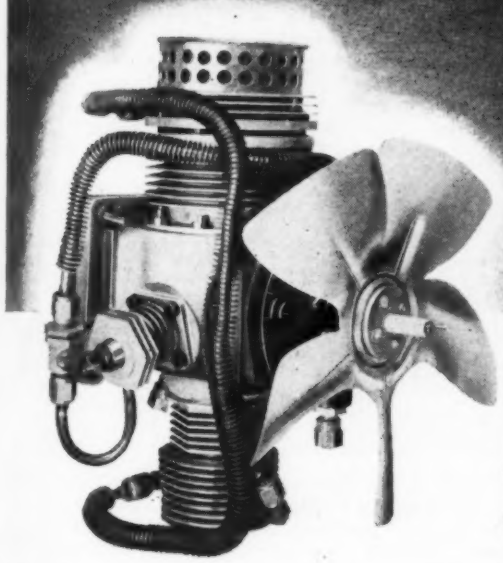
Circle 37 on Reader Service Card



NOW-A NEW CEILING FOR PNEUMATICS



New Kidde Compressor delivers volume at High Altitudes

High altitude—the bugaboo of pneumatically operated airborne equipment—has been licked by the new Kidde 4-stage compressor.

At 35,000 feet, this new, lightweight Kidde compressor will from ambient pressure, deliver one cfm of free air compressed to 3,000 psi. At sea level it will deliver *four* cfm of free air compressed to 3,000 psi. When inlet air is pressurized, *the sea level performance can be maintained at high altitudes.*

This new compressor, now being produced for installation in the planes of a leading aircraft company, opens a whole new field for the use of pneumatics. Its light weight and reliable performance make it well worth your consideration. Why not write and let a Kidde engineer supply you with full information on the Kidde compressor and the Kidde pneumatic devices for aircraft use.

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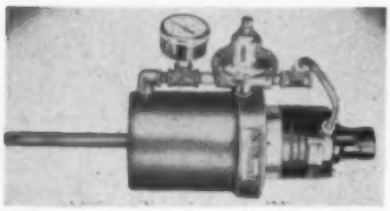
application and performance of NEW COMPONENTS

AIR CYLINDERS FOR THROTTLING CONTROL — Conoflow Corporation, announces the B-50 Series of pneumatic cylinders for throttling control service. Available in 4, 6, and 8 in bores with strokes up to 4 in, these cylinders consist essentially of a new design of "O" ring sealed pneumatic cylinder with a piston positioner integrally mounted to the head plate. The cylinder is a bucket type cylinder of cast aluminum. A one-piece piston is fitted with a graphite-impregnated "O" ring, providing a perfect seal with a minimum of friction. Head plate and piston stem are also "O" ring sealed, eliminating head bolts and gland packing.

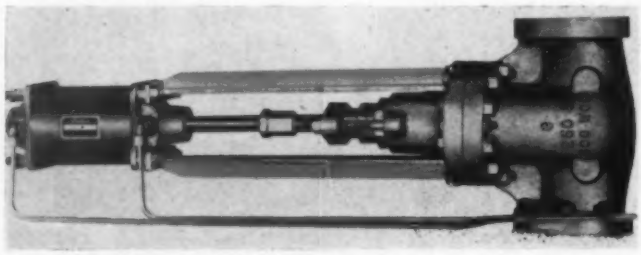


Circle 99 on Reader Service Card

NEW "O" RING COMPOUND — "O" rings and other precision molded seals may now be obtained in a newly-developed extreme temperature range synthetic rubber compound, it is announced by The Parker Appliance Company. Resistant to non-fuel petroleum products such as hydraulic fluids, the new compound, Parker 42, functions effectively in sealing performance anywhere in the temperature range of from -85 to 275 F. Other physical characteristics of the new formulation are: tensile strength 2000 psi; elongation 300 percent; Shore A hardness 60; and permanent set 3 percent.

Circle 100 on Reader Service Card

VALVE ACTUATORS — A line of valve actuators, introduced by Ledeen Manufacturing Co. uses Ledeen cylinders equipped with brackets, valves, controls,



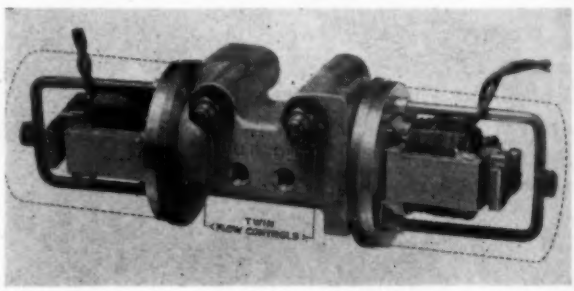
and couplings to make them suitable for almost any type of operation. They can be adapted to any make, size, and type of valve; to operate against any line pressure; to work on any fluid medium, and with any pressure available. They can be arranged for on-and-off service or for positioning service.

Circle 101 on Reader Service Card

HYDRAULIC CYLINDERS — Covers on this new hydraulic cylinder may be rotated for any pipe connection and installation made in a minimum of space. Offered by Rivett Lathe & Grinder, Inc., this cylinder uses a modern keeper ring design to permit rotation of covers. External "O" rings, instead of ordinary gaskets, are used as static seals, to provide for leak-proof operation. Sealing efficiency of the ring improves with increased pressure. Automotive type rings are used on the piston to reduce friction to a minimum.

Circle 102 on Reader Service Card

DOUBLE SOLENOID VALVE — A new corrosion resistant double operated solenoid valve for air and low pressure hydraulic cylinders has been designed and manufactured by Airmatic Valve, Inc. Called the DDS-4-375, the valve is used where pressure must be held on one side of the cylinder for a given period of time. Also featured are built-in flow controls to govern the



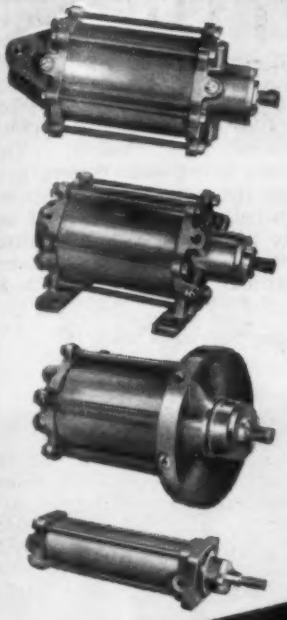
speed of the cylinder. The valve may be reversed by momentarily energizing a single solenoid, and the cylinder may be held in position without the necessity of holding either solenoid energized. Power failure will not reverse the valve or cylinder. The only moving part is a one piece stainless steel spool which carries an "O" ring type seal. There are no springs as the valve is operated directly by the solenoids. This new model is available in ¼, ⅜ and ½ in full orifice area in two styles of mounting.

Circle 103 on Reader Service Card

TIMER—General Control Company has designed a new synchronous-motor timer to be used for all time periods between ½ second and 24 hours. It actuates five s.p.d.t. load contacts independent of the timer-control circuits. There are two separate solenoids—one operates the clutch and timing mechanism, the other actuates the load contacts. The timer automatically resets for each new cycle. Sturdily mounted in a cast frame, long life is assured through a unique "O" ring drive assembly which eliminates gears. The pre-set interval and the elapsed time are both clearly visible on the 3-⅜ in diameter dial.

Circle 104 on Reader Service Card

HANNIFIN has them!



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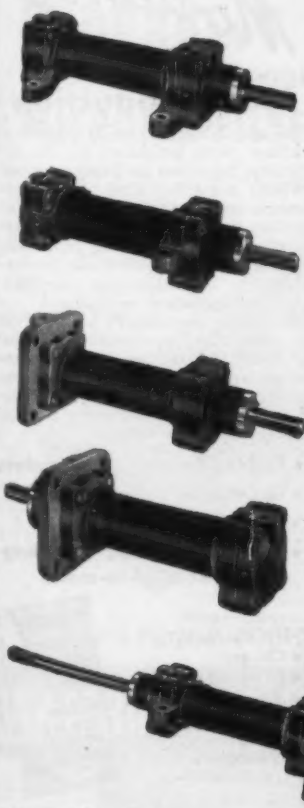
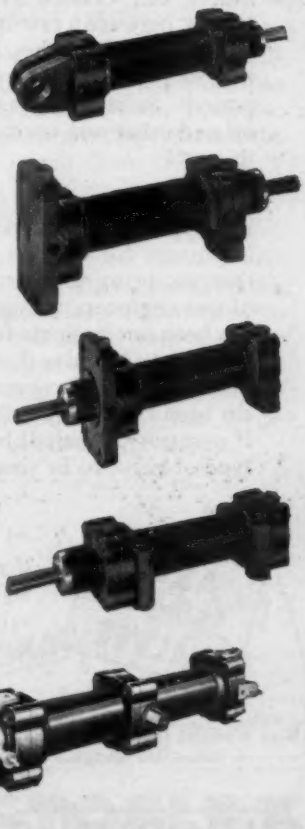
Hannifin also offers many special designs to meet space limitations, for special mounting conditions, for pressures other than standard. We supply these in small quantities to makers of special machines, in larger quantities to the material handling, farm implement, and similar fields. Where considerable quantities are involved, a custom cylinder—tailored to the exact requirements of the job—is often actually cheaper.





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We recommend this valve for controlling equipment where pressure must be alternately applied and exhausted as, for example, with diaphragm motor valves, air or hydraulic cylinders, etc. Classed as Bulletin 8331 ASCO Valves, here are a few specifications: pipe sizes 1, 1¼, 1½ and 2 inches. Maximum pressure 125 to 250 pounds; minimum pressure 10 to 20 pounds. Suitable for handling air, water, gas, oil and other non-corrosive gases or liquids up to 180°F.

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ASCO Solenoid VALVES

If you have recurrent and varying needs for automatic control valves, you should have our General Valve Catalog No. 23.

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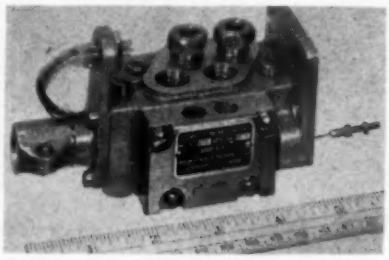
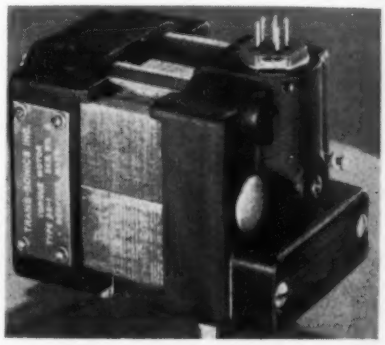
SERVO CONTROL VALVE — The servo control valve, Models MX and XA, built by Hydraulic Controls Co., is a precision component for use in high performance electro-hydraulic servomechanisms requiring high natural frequencies and delivering in excess of 5 horsepower. The servo valve consists of two sections, a pilot valve and a power valve. The pilot valve, acting as a pre-amplifier, controls the position of the power valve which in turn controls the delivery of up to 5 horsepower of hydraulic power to a ram or fluid motor. The pilot valve requires for its maximum effectiveness an electro-mechanical transducer, such as a torque motor.



Circle 105 on Reader Service Card

TORQUE MOTOR FOR ELECTRO - HYDRAULIC SERVO — Trans-Sonics, Inc. offers the type 35-1 torque motor, an electro-mechanical device that utilizes an electrical current to produce translational motion suitable for moving the piston on a hydraulic servo



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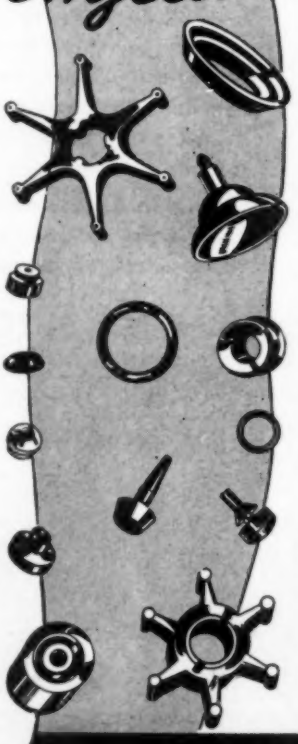

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- Grommets
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- Pump Impellers
- Specialized units including rubber-bonded-to-metal

OFFICES: *New York*
• *Chicago*
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Write for Circular on INJECTION MOLDING or O-RINGS

MINNESOTA RUBBER & GASKET CO.
3642 Wooddale Avenue
Minneapolis 16, Minn.

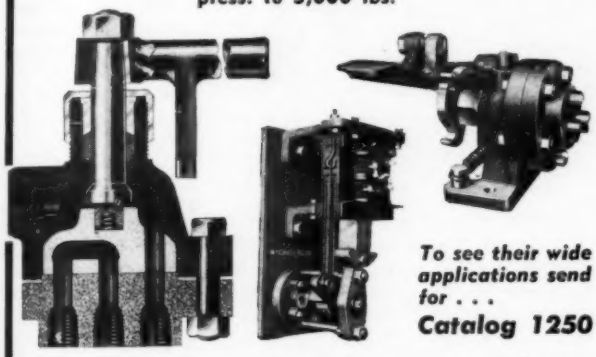
Circle 40 on Reader Service Card

Circle 41 on Reader Service Card

Stock Fewer Spares . . . You Can Use

Nicholson Valves for Any Pressure Medium

Nicholson control valves offer maximum adaptability. A rubber processor reports that they carry only 1 spare valve for each 52 in service. Unlike many poppet or balanced piston valves, they can be used for steam as well as air, gas, oil or water. Lever, foot, solenoid, motor types; size ¼" to 2½"; press. to 5,000 lbs.



To see their wide applications send for . . .
Catalog 1250

W. H. NICHOLSON & CO. 213 OREGON ST. WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

Protect HYDRAULIC EQUIPMENT

WITH HIGH PRESSURE

MICRONIC FILTERS

• 3000 p.s.i. Operating Pressure, Micronic Filtration, Low Pressure differential, Compact in Line Type

• Maximum Protection at minimum cost. Replaceable element.

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WATERMAN ENGINEERING *Company*
721 CUSTER AVENUE • EVANSTON, ILLINOIS

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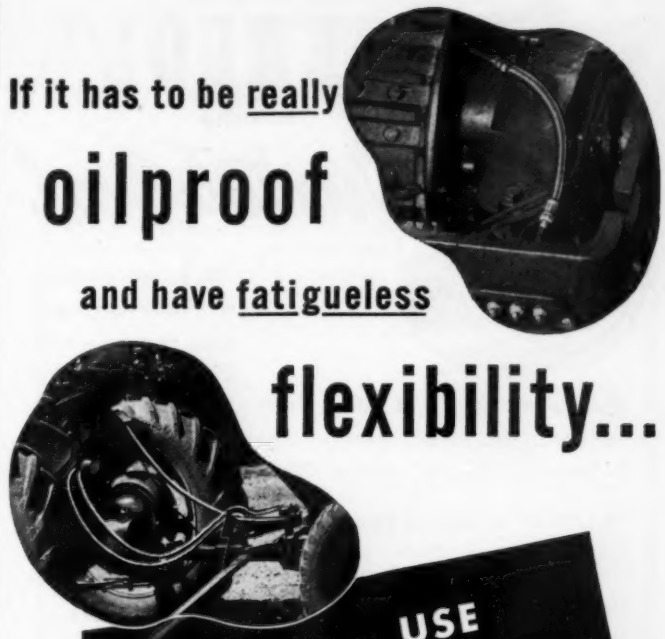
If it has to be really

oilproof

and have fatigueless

flexibility...



USE
RESISTOFLEX
HOSE ASSEMBLIES

There's nothing to fatigue in Resistoflex hose—not the synthetic rubber jacket, the high grade yarn braiding, nor the compar tube.

And no gumming, eroding or swelling from oil either. For the compar tube is impervious to water-insoluble oils and compounds. The compar tube also adds more than necessary strength for medium pressures and shock loads in hydraulic systems.

For years, many well known companies have standardized on Resistoflex Hose Assemblies to assure minimum line troubles and replacements. You, too, will find that Resistoflex quality pays off in the long run. Write for specification sheets.

For out of the ordinary engineering with synthetics

RESISTOFLEX
CORPORATION
Belleville 9, New Jersey

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"SEALOL"

PATENTED

The Versatile Seal

This balanced-pressure face seal really gets around — and it's easy to see why! For a wide variety of rotary shaft applications — fluids, temperatures, speeds, pressures, and space requirements — there's a "Sealol" design. Here are a few examples:

"SEALOL"– Sealed Fuel Pumps

36,000 RPM	¾" Shaft	200°F	Kerosene	300 PSI
3,500 RPM	¾" Shaft	150°F	Aviation Gasoline	60 PSI

"SEALOL"– Sealed Hydraulic Pumps & Motors

1,800 RPM	1⅛" Shaft	Room Temp.	Ucon Hydraulic Fluid	1500 PSI
11,000 RPM	2¼" Shaft	200°F	Lube Oil	20 PSI

"SEALOL"– Sealed Transfer Pumps

1,750 RPM	2½" Shaft	200°F	Acid and Caustic Dye Liquors	15 PSI
3,500 RPM	1⅛" Shaft	Room Temp.	Propane	350 PSI
1,750 RPM	1" Shaft	600°F	Heat Transfer Fluid	50 PSI
1,800 RPM	1" Shaft	200°F	Brine	100 PSI
60 RPM	½" Shaft	70°F	Sulfur Dioxide	100 PSI

"SEALOL"– Sealed Gear Boxes & Speed Reducers

6,800 RPM	5" Shaft	125°F	Lube Oil	Atmos. Pressure
18,000 RPM	1¼" Shaft	150°F	SAE 10	20 PSI

"SEALOL"– Sealed Agitators & Mixers

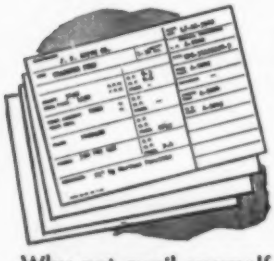
80 RPM	2¾" Shaft	350°F	Steam and Hot Air	Atmos. Pressure
300 RPM	1" Shaft	450°F	Acetone Vapor	50 PSI

"SEALOL"– Sealed Gas Turbines

15,000 RPM	1⅝" Shaft	300°F	Alcohol Vapor	65 PSI
7,700 RPM	5¼" Shaft	356°F	Lube Oil	2 PSI
53,000 RPM	1" Shaft	350°F	Oil and Steam	350 PSI

"SEALOL"– Sealed Compressors & Super-Chargers

3,024 RPM	3½" Shaft	250°F	Oil Mist and Air	7½" Hg. abs.
70,000 RPM	½" Shaft	230°F	Oil Mist and Air	19" Hg. abs.



Also: washing machine pumps, dynamometers, boiler feed water pumps, drill press spindles, steam compressors, oscillating dryers, drying rolls, air chucks, natural gas flow meters, sea water pumps, water pumps. Why not avail yourself of this fund of seal-engineering experience: Our Engineering Department is at your disposal. Send blueprints and specifications to Sealol Corporation, 45 Willard Ave., Providence 5, R. I.

SEALOL

Chicago • Cleveland • Detroit • Los Angeles
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valve. The torque motor, weighing 17 ounces, is characterized by high speed of response, high force output, immunity to environmental accelerations, and low required driving power. The motor provides a linear motion of .004 in and will move approximately .001 in per milliampere of signal current. The locked rotor force output is 4 pounds for differential current of 5 milliamperes.

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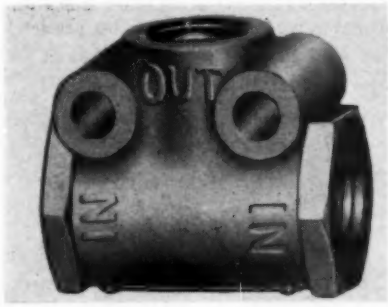

HIGH PRESSURE PNEUMATIC SHUTTLE VALVE — Introduced by Westinghouse Air Brake Company, this shuttle valve is used on aircraft control systems and is suitable for other high pressure air systems. This device is used to deliver from the outlet port either of two inlet pressures depending upon which is the higher. Using disc type construction, the valve has a maximum operating pressure of 1500 psi and an ambient temperature range of plus 160F to minus 65F.

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REMOVES OIL VAPOR FROM AIR LINES — Continuous removal of petroleum vapor from compressed air and other gases by the Vape-Sorber, a newly de-

Quick-As-Wink AIR AND HYDRAULIC Control Valves

No. 3401-R-4
½ Inch 4-Way
Foot Valve

FOOT OPERATED Air Valves

Increase output of hammers, shears, presses, etc.

● Operators have both hands free to handle the work — speeding production. Valving mechanism has stainless steel body and push-pull rods, brass sleeves, self-sealing U-packers and many other refinements, all fully enclosed against dirt, assuring long efficient trouble-free operation. Convenient pipe connections. No metal to metal seating. ⅜" to 1" sizes, 3-way and 4-way, neutral position and regular actions. *Write for full details.*

THE HIGHER THE PRESSURE THE TIGHTER THE SEAL

Quick-As-Wink AIR AND HYDRAULIC Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by **C. B. HUNT & SON, INC.**, 1967 E. Pershing St., Salem, Ohio

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Circle 46 on Reader Service Card

ALLEN TRU-ROUND DRYSEAL PIPE PLUGS

100% PRESSUR-FORMD.

- NEVER OUT OF ROUND
- LEAKPROOF METAL-TO-METAL SEAL
- FULL STRENGTH SOCKET WON'T STRIP OR WEAR

Ideal for extreme pressure applications. For use with dry-seal taps. No sealing compound required. Pressur-Formd socket, unweakened by drilling and broaching, is stronger than the strongest key. Pressur-Formd burnished threads are nick and distortion-free, insure perfect thread contact, won't gouge softer metals. Perfect taper plus 360° roundness at both pitch and crest diameters assure accurate fit. Now available in 1/16" to 1-1/4" sizes. No increase in price.

Sold only thru leading distributors. Write direct for samples and engineering data on Allen Dryseal plugs, also Allen Tru-Round *Standard* Pressur-Formd plugs for a better seal in normal applications.

WARNING

Allen-TYPE screws aren't necessarily Allen-MADE. Be sure to get genuine Allens in the black and silver box.

ALLEN (ALLEN HEAD)

MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.

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HANNIFIN AIR CONTROL Valves

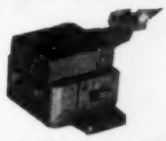
NEWEST TYPES! EXCLUSIVE DESIGNS for EVERY PURPOSE!

THE Hannifin line of Air Control Valves is complete—sizes and types for every purpose! Hannifin leads with newest, exclusive designs for fast, effortless control of air cylinders, presses, and other air operated equipment. Ask for recommendations.

"PACKLESS" HAND OPERATED

Simple, smooth-acting, positive 3-way or 4-way valves. "Packless" rotary disc type. Self-lapping. Sizes from ⅛" to 1¼". *Ask for Bulletin 57W.*

"EFFORTLESS" HAND OPERATED

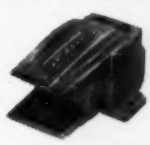


Fast, new, finger-tip, pilot operated sliding disc valve. Effortless; air pressure does the work! For single or double acting cylinders. *Ask for Bulletin 241.*

"PACKLESS" FOOT OPERATED

Treadle type; leaves operator's hands free for other work. Tight-sealing, self-lapping, rotating bronze disc. Sizes ¼" up to ¾". *Ask for Bulletin 57W.*

"EFFORTLESS" FOOT OPERATED



Fast, new, pilot operated, disc type valve. Light, effortless action. Rugged construction. With or without pedal guard. *Ask for Bulletin 240.*

HANNIFIN CORPORATION

1155 S. Kilbourn Ave. Chicago 24, Illinois

"SEAL-GUARD" METALLIC ROD WIPER

PROTECTS YOUR CYLINDER RODS, MACHINE SPINDLES, GUIDE PINS AND LOCATING PINS

The "Seal-Guard" Metallic Rod Wiper affords permanent protection from falling or flying debris . . . Two flexible bronze rings mounted in synthetic rubber lift off harmful substances completely by means of their knife-edged conical surfaces . . . The device is self-adjusting through action of rubber on staggered scraper rings . . . Rod diameter sizes are from ½ to 10 inches.

Write for Literature

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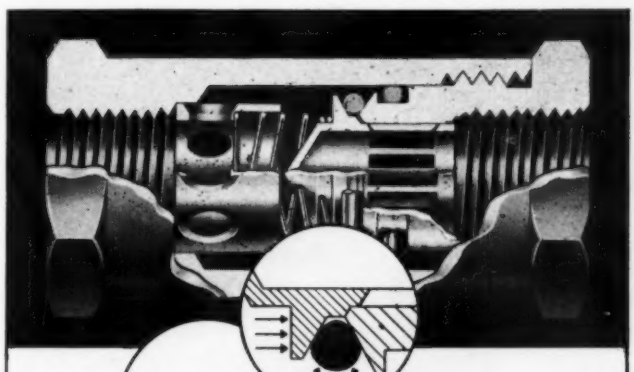

The CIRCLE SEAL *principle insures*

ABSOLUTELY LEAKPROOF *performance unequalled in any* **CHECK VALVE**

Circle Seal Check Valves provide positive, bubble-tight sealing in any mounting position. The resilient "O" Ring cushions the closing shock — seals to eliminate back flow or leakage.

Pressures: 0 to 3000 psi
Temperatures: —65° F to 280° F
Sizes: 1/8" to 1"

CIRCLE SEAL *precision check valves*

JAMES-POND-CLARK
1247 East Green Street
Pasadena 1, Calif.

Engineering data sent free of charge on request.

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POWER...

- ECONOMICAL
- RUGGED
- VERSATILE

LINDBERG AIR & HYDRAULIC CYLINDERS

For Pulling—Pushing—Lifting—Forcing—Clamping—Pressing

Whether it's one of the 12 standard bore sizes in one of the seven mounting types — or a special cylinder built to your specifications — there's a Lindberg Air or Hydraulic cylinder for your specific need.

Remember — Lindberg cylinders effect great savings through the reduction or elimination of costly mechanisms formerly needed for a variety of power purposes — and their adaptability and ruggedness makes them useful for many industrial purposes.

WRITE FOR BULLETIN 731

Get complete details on all standard Lindberg Air Cylinder models and sizes with complete tables on bores, pressures, weights, mountings and conversion to low pressure hydraulics.

LINDBERG AIR & HYDRAULIC CYLINDERS

Lindberg Engineering Company, 2441 W. Hubbard Street
Chicago 12, Illinois
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veloped device, is announced by Selas Corporation. The unit is installed in air or gas lines to instruments and critical pneumatic operations where "oily air" has detrimental effects. In addition to removing petroleum vapor, the Vape-Sorber removes water, free oil, emulsions and dirt. Liquid-impervious ceramic filters operate in conjunction with specially compounded activated carbon to deliver clean air to operating equipment.

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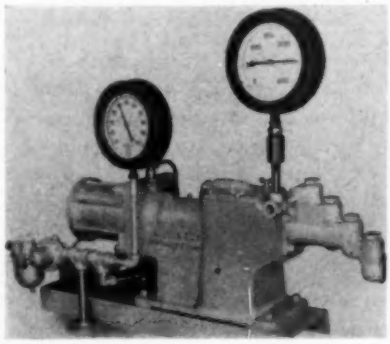
PRESSURE GENERATOR FOR HYDROSTATIC TESTING — Milton Roy "aiROYmetric" pressure generator is combined with a group of specially designed simplified controls to develop test pressures up to 25,000 psi, using ordinary plant air supply in the pump cylinder. Each of the pumps develops a discharge pressure ratio range of at least 6 to 1, permitting single pump use for applications requiring various test pressures. Individual units may be custom made for specific applications between 25 psi and 25,000 psi and capacities from 4 gph and 405 gph. The pressure generator has use in the hydrostatic testing of tubing and piping systems, and has application as a booster pump for maintaining required pressures in hydraulic systems.



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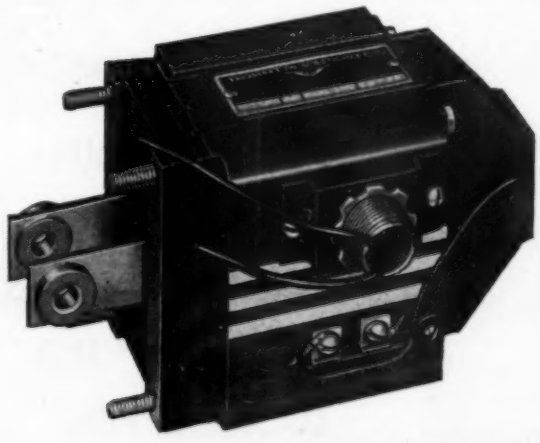
SOLENOIDS FOR HYDRAULIC VALVES . . . . .



G-611-X SOLENOIDS

- Trombetta G-600 solenoids are specially designed to mee severe operating conditions
- Make your selection from our complete line of standard or special solenoids
- Solenoid brakes of all sizes are also available

TROMBETTA SOLENOID CO.
331 N. Milwaukee Street • Milwaukee 2, Wisconsin

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Circle 52 on Reader Service Card

...and still going up!

40 MILLION CYCLES...

30

20

10

RECORDED
IN A MAJOR AUTO PLANT
BY A *Crescent Valve*

PRODUCT OF CRESCENT VALVE CO.

Series 1046 four-way valves are solenoid controlled, pilot operated for use on air, water and light oils from 0 to 150 psi. They are intended for continuous duty, fast cycling (up to 600 cycles a minute) of double acting cylinders. Write for literature and prices to:

SOLE DISTRIBUTOR

BARKSDALE

1566 EAST SLAUSON AVENUE, LOS ANGELES 11, CALIFORNIA

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The "manufacturer's" gauge—

For years Marsh Gauges have been first choice of manufacturers of controls and other equipment where pressure indication plays a vital part. Their use on *your* product is a mark of distinction.

The finer construction of Marsh Gauges is not limited to costly types, but is common to the entire line in square relationship to the service for which they are recommended. All—regardless of cost—are *quality* instruments.

Write for this catalog covering the broader Marsh line.

MARSH INSTRUMENT CO.

Sales affiliate of Jas. P. Marsh Corp., **DEPT. 19, SKOKIE, ILL.**

Export Dept., 155 East 44th Street, New York, New York

RHOADS

Tannate

U-VEE-CUP FLANGE

LEATHER PACKINGS

"TAILOR-MADE"... FOR YOU

by Leather Craftsmen

Since 1702, we have specialized in producing fine leather products. In this tradition, Tannate Leather Packings are made with the greatest care and exactitude to fit your specifications and to assure long, dependable service. Because of Tannate's tough, pliable, oil resistant qualities they effectively seal-in lubricants and many chemicals. Available for hydraulic or pneumatic service over a wide range of pressures and temperatures.

Write for complete specifications.

PRODUCERS OF FINE LEATHER FOR 249 YEARS

J. E. RHOADS & SONS

35 NORTH SIXTH ST., PHILA. 6, PA.

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BARCO

High Pressure

SWIVEL JOINTS

Flexibility for

HYDRAULIC PIPING, TUBING!

- **AIRPLANE TYPE** — First developed for use on large planes; now widely applicable to industrial hydraulics.
- **FOR BETTER ENGINEERING!** Put flexibility where you want it—without the nuisance of sagging, flopping non-rigid lines. No expansion under pressure. 360° swivel action, with or without side flexibility. No binding. Functions perfectly at extremely low temperatures.
- **SMALL, LIGHT, COMPACT** — Many styles and sizes, ⅛" up. Pressure ratings to 3,000 p.s.i., or higher under certain conditions.
- **PRESSURE SAFE** — The seal will not break or blow-out suddenly. High temperature and fire resistance.
- **ENGINEERING RECOMMENDATIONS** — Backed by years of experience. Ask for information.

Nationwide Sales and Service.

BARCO MANUFACTURING CO.

1832 Winnemac Ave., Chicago 40, Illinois

In Canada: The Holden Co., Ltd.

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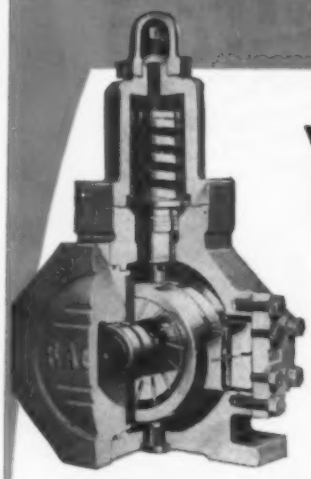
FULL VOLUME HIGH PRESSURE

. . . BUT LOW HORSEPOWER

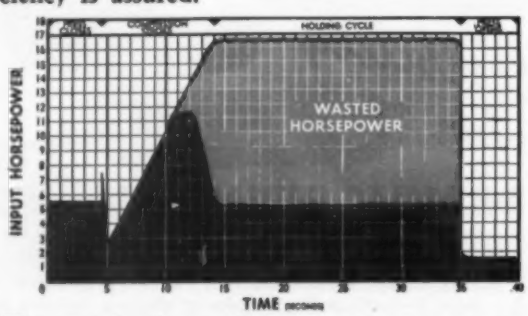


with RACINE Hydraulic PUMPS

High pressure holding is economical with RACINE Variable Volume Pumps. They will automatically cease their pumping action but maintain full pressure in the system. Instant change from no volume to full volume insures smooth, sure application of hydraulic force. Horsepower requirements are measured by the actual needs of the job — all of the oil is put to work.

RACINE Variable Volume Pumps eliminate the need for relief valves — reduce oil heating — save horsepower and lower the over-all cost of most circuits.

Various standard governors are available for RACINE Pumps. These governors develop the pumping action that will best handle special requirements of the circuit. Maximum efficiency is assured.



The graph above illustrates the horsepower savings in a simple press circuit using a RACINE *Variable Volume Pump and Pressure Booster. The area in color represents the bypassed oil from a constant volume pump—lost power that is saved with* RACINE *Equipment.*

Write for complete catalog and engineering data.

RACINE

TOOL & MACHINE COMPANY

1774 State Street, Racine, Wis., U. S. A.

STANDARD FOR QUALITY AND PRECISION

Circle 56 on Reader Service Card

Old Industry — New Methods

(Concluded from page 38)

pletely frank in his comments concerning the operation of the machine. Many of his suggestions were acted upon and incorporated into the finished machine. This policy of employee participation has proven itself many times and goes a long way in establishing acceptance of new machines.

The success of this machine was such that within six months the Engineering Department was given a go-ahead to make whatever changes they felt were necessary on the blueprints and to start work on a second model. These changes included consolidation of the two air cylinders mounted on the front and back of the machine into one double ended cylinder mounted on the bottom of the machine and acting through a linkage system consisting of rockers and push rods. This change served to increase the mechanical advantage of the work stroke, as well as decreasing the overall size of the machine.

Air Cylinder Size Increased

To further increase the capacity, the bore diameters of the air cylinders were increased from 3-½ to 5 inches. This was done to insure sufficient power for cutting heavy handles such as carving and meat sizes. Other minor design changes were made, the final blueprints accepted and the second machine built. This model is shown in Figure 1.

This machine proved to be far superior in performance to the original model; shortly thereafter alterations were made to bring the first machine up to date.

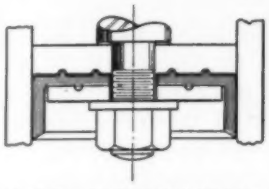
Some of the many advantages of the new machine over the old shimmy press are: (1) a considerable saving in gross weight (425 pounds vs 1700 pounds; (2) saving in floor space (16 sq ft vs 36 sq ft); (3) Saving in power consumption (1.2 hp, intermittent operation vs 3 hp continuous operation); (4) an increase in tool life from 300 to 500 percent; (5) low first cost (all parts, except main casting, are standard purchased parts); (6) closer precision of work (.002 to .003 inches with improved "mitre" of completed handle); (7) safer operation; and (8) complete independent control of time cycle for each operating stroke to assure proper time interval for completion of each cut.

The persons who collaborated with the author to make this machine a reality are Ernie Desrochers, tool maker and Leighton Reynolds, draftsman, of our own organization. The author also wishes to give credit to William Gibson of the Gibson Engineering Company of Boston for his recommendations of air cylinders, control valves, time delay units, etc.

TROSTEL'S

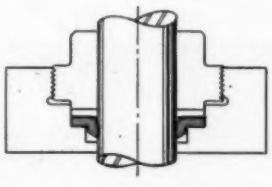
ENGINEERED PACKINGS IMPROVE PRODUCT PERFORMANCE . . .

LEATHER • SYNTHETIC



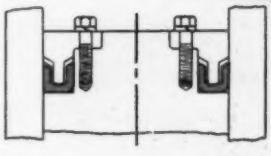
CUP PACKINGS

Leather or rubber, are designed to seal fluid in a hydraulic activated piston. Specifically applied in presses, pumps, jacks and feed mechanisms.



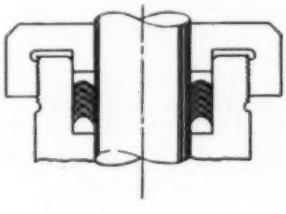
FLANGE PACKINGS

Custom made to seal shafts, spindles, stems and the outside periphery of cylindrical moving parts against leakage caused by internal pressure.



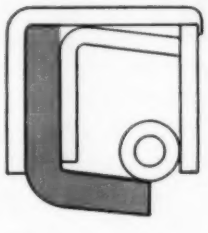
U PACKINGS

Designed to seal reciprocating rather than rotating parts. Ideal for severe working conditions.



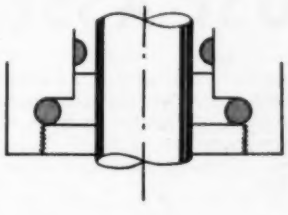
V PACKINGS

Effectively used for sealing bores or inside walls of cylinders, rotating or reciprocating shafts. Provides long service under high hydraulic pressure and high temperatures.



OIL SEALS

Precision made to seal fluid in special designed equipment. Assures dependable performance under all operating conditions.



O-RING PACKINGS

Engineered to meet specific design, functional and long life service. Provides dependable performance under rough use, high pressures and ranges of temperature.

Trostel offers a complete line of leather or synthetic compounded packings for all hydraulic and pneumatic applications. Specify standard or custom made Trostel packings and be assured of dependable performance under all operating conditions. Take advantage of Trostel's complete service-design engineering, mold making and modern production facilities to give you the most economical solution to your packing problems.

Write today for catalog AH-2 for detailed information.

ALBERT TROSTEL & SONS COMPANY

Packings Division

MILWAUKEE 1, WIS.

Fast Setup—
Short Run Efficiency

(Continued from page 42)

Sequence of Operations

The operator starts the hydraulic pump motor, then pushes "adjust" button on the selector switch panel. This inactivates the machine during setting of adjustments. He then sets the four sliding scales for the width, length and cut-off dimensions desired. Width and depth settings are made by operation of the width and depth push buttons; slitter and scoring roll adjustments are made with the selector switches as well as the cut-off adjustment.

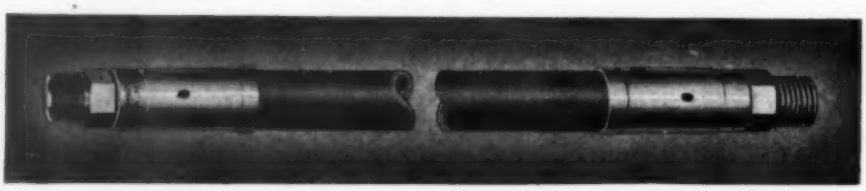
The operator then pushes control button on the selector panel from "adjust" to "run". The machine is ready for the stock.

The operator places the corrugated sheet stock on the loading table and pushes the stock against the stock edge guide on the infeed table. The stock passes under and actuates roller arm limit switch LS-1 at the right edge guide. LS-1, when actuated, energizes solenoid 5, building up pressure in the hydraulic system and energizing solenoid 1, causing feed and creasing rolls to operate at high speed for passage of the board through the machine. LS-2, when actuated, keeps machine in operation until the trailing edge of the board has passed through the machine.

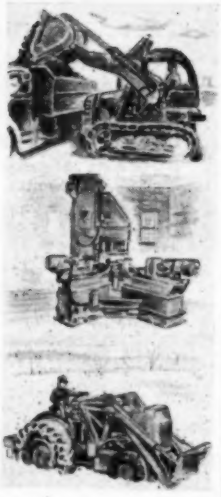
Feed Roll Control

Limit switches are set in pairs, spaced 2 ½ inches apart on the width and length rails, along the path of the advancing stock. When the leading edge of the stock depresses the first limit switch tripper (LS-3), solenoid 2 is energized, checking the feed rolls to slow speed. This action also energizes time relay 1 and relay 1. When the advancing leading edge depresses the second limit switch tripper (LS-4), time relay 1 and solenoid 1 are deenergized. This stops the feed rolls. The same action energizes solenoid 3, causing the slotter mechanism to cycle. The slotter knife beam drops, cuts two slots and scores the board for the flaps.

The downward movement of the slotter mechanism actuates LS-11; this acts as a block to keep solenoid 1 deenergized, the interlock assuring that the feed rolls will not move during the slotter operation. At the



MULCONROY
Hydraulic
HOSE ASSEMBLIES



Complete units, ready for quick, easy installation on all types of hydraulically operated or controlled equipment. Available in three basic hydraulic hose constructions to meet all required working pressures. Complete range of sizes, in lengths up to 50 feet.

With "PRESS-LOCK" *Couplings*

Left: Cut-away view showing unique construction of "Press-Lock" Coupling. Note that entire hose wall is employed.

The "PRESS-LOCK" is based upon an entirely new coupling-to-hose anchoring principle which assures strength, durability and safety unequalled in any other coupling of the pressed-on type. The hose itself provides a major portion of the coupling's tremendous holding power through its displacement inside the coupling sleeve. Because the **entire hose wall** is utilized—for the full length of the coupling—hydraulic hose equipped with "PRESS-LOCK" couplings will withstand shock loads and continuous flexing far beyond the limits of hose connected with conventional pressed-on fittings. Literature available.

"MULCONROY *Starts...* WHERE OTHERS *Stop!*"

MULCONROY CO. *Hose Specialties Since 1887*
5329 JEFFERSON ST., PHILADELPHIA 31, PA.

PLENTY of POWER

IN THESE HYDRAULIC PUMPS and FLUID MOTORS

There's plenty of power in Eastern fluid motors and hydraulic pumps. They're tough and compact—ideal where space is at a premium. They're dependable, too. Long life under rugged operating conditions is built-in. An Eastern hydraulic pump or fluid motor in your design is good engineering.

SERIES 100

.1 to 5 GPM—Drive speeds up to 3450 RPM. Working pressures up to 1000 PSI. Average volumetric efficiency: 90%. Average model weight: 1.65 lbs.

Lightweight construction is obtained through use of aluminum housings and nitralloy gears and shafts. Each unit is factory pre-tested for precision and operating efficiency.

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bottom of the slotter mechanism movement, contacts reset time relay 1, deenergizing relay coil 1 and solenoids 2 and 3. At the completion of the stroke, LS-11 closes, energizing solenoid 1 for high speed operation of the rolls.

Actuate Cut-off Cylinder

The actuation of LS-5 and LS-6 repeats the slotter cycle for slot 2; actuation of LS-7 and LS-8 repeats for slot 3.

The last three limit switches on the sliding scales operate somewhat differently since they actuate the cut-off cylinder and blades. As LS-9 and LS-10 are depressed, the rolls slow down, then stop as in the previous operations. When both LS-9 and LS-10 are depressed, solenoid 4 is energized, actuating the cut-off cylinder to cut off the stock. LS-18 is provided for a fourth slot.

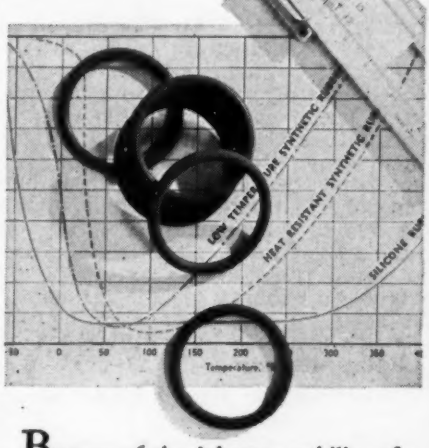
The movement of the cutter blade opens LS-I2, then closes it as the blade retracts, energizing solenoid 1 for high speed operation of the rolls.

When the trailing edge of the stock clears LS-2, this switch opens, stopping the machine and deenergizing solenoid 5, dropping the hydraulic system pressure. This completes one complete automatic cycle and slotting, scoring and cutting-off of one complete taped joint box.

When four slot operations are required on stitched flap joints, the fourth slot is made after the cut-off and will be located 1 ½ inches from the trailing edge of the blanks. A selector switch is provided for this purpose, making LS-18 vulnerable.

The versatility of the machine interests container manufacturers as well as users for special orders in lots of 500 or less. One of the earliest installations of this machine is in the plant of a container manufacturer.

SILICONE "O" RINGS OFFER UNIQUE DESIGN POSSIBILITIES



Because of the inherent stability of silicone rubber, Arrowhead "O" rings molded of this remarkable new material provide a long-lasting seal under conditions far beyond the limits of ordinary rubbers. For example, they remain flexible at -130° F.; withstand indefinitely, exposure to temperatures of 500° F. and over. They offer excellent resistance to oxidation, to many oils, acids, alkalies and a variety of chemicals. The ideally inert characteristic of these seals is demonstrated by their astonishing resistance to aging, even at abnormally high temperatures. At normal temperatures they last *indefinitely*. For superior performance under severe conditions, consider silicone rubber. Arrowhead's *silicone specialists* will welcome your inquiry.

Write **FOR ENGINEERING DATA**

Free to Engineers—two valuable new publications on silicone rubber and "O" rings. Contain complete technical and descriptive data, including typical applications.

ARROWHEAD RUBBER CO.

Division of
National Motor Bearing Co., Inc.
DOWNEY (Los Angeles County) CALIF.

"O" RINGS ▼ SILICONES ▼ AIRTRON-DUCTS

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Useful Catalogs and Bulletins

available for reference

Safety Featured in Air Couplings and Valves . . . Bulletin HF 747 issued by the Cleco Division of the Reed Roller Bit Company illustrates their line of pressure-seated shut off valves, hose couplings, clamps and nipples. While listing available sizes and styles, this 12 page bulletin, emphasizes the safety features of this line. When the self-seating valves are closed to air flow, they bleed the downstream line reducing it to atmospheric pressure, so that subsequent disconnecting avoids a sudden blast of air. The bleed port in these valves make possible their use as 3-way valves on small quick-acting cylinders, as the bleed port acts as an exhaust for the return stroke. Valves are designed for maximum working pressure of 125 psi and are avaiable in 4 different porting styles to facilitate installation.

Circle 110 on Reader Service Card

Cellular Rubber Properties and Test Data . . . Compiled by The Sponge Rubber Products Co. this twenty page booklet includes graphs and charts to plot the various physical and chemical properties of sponge rubber. Army-Navy specifications are tabulated and manufacturing tolerances listed. While sponge rubber is widely used in many industries, the machine builder will find it particularly useful for shock and vibration damping, sealing and gasketing, and dust proofing. A summary of products charts the available materials and shows the uses and the available shapes.

Circle 111 on Reader Service Card

"The Facts About Clean Oil" . . . is the title of a new 16 page booklet giving important, up-to-date information on oil purification for hydraulic equipment. Prepared by the Honan-Crane Corporation, the new booklet answers all the questions about oil purification and shows correct method and equipment to stop downtime, cut down rejects, and improve and increase plant production. Case histories describe how many major plants all over the country have realized substantial savings in oil consumption and equipment operating and maintenance costs.

Circle 112 on Reader Service Card

Air Valve Features Safe Operation . . . An illustrated bulletin on the new Ross Safety valve shows a cross-sectional detail and lists the operating characteristics. This Ross valve is said to establish new safety standards for industrial press and similar applications because of the elimination of all springs and the use of a clapper type solenoid.

Circle 113 on Reader Service Card

New 100 Page Packings and Gaskets Catalog . . . Currently being distributed by the Packing Division of Raybestos-Manhattan, Inc. is a new 100 page catalog featuring R/M Packings and Gaskets. The book, loose-leaf style, in a leatherette cover, uses illustrations sufficiently large to show the actual cross-section of many of the items described. In addition to complete descriptions of the various packings and gaskets, three pages are devoted to charts showing recommendations of R/M engineers for packing types of equipment against a long list of services. Eight pages of engineering data provide information on common causes for packing failure; advantages of lantern glands; suggested procedure for proper installation of packings; and several convenient numerical tables.

Circle 114 on Reader Service Card

Control Valve for Single-action Rams . . . A bulletin sheet, 2-V, prepared by Blackhawk Mfg. Co., gives applications and dimensional data on their three-position, hand operated hydraulic valve. After the handle has been moved forward or backward to raise or lower position, sturdy springs automatically return the valve to neutral hold position. Removable reducer pipe bushings make it possible to use this valve in ¼ or ⅜ in piping systems. One of the available models includes a hurdle device which restricts oil surge when pressure is released making possible cushioned lowering and adapts the valve for use in controlling two or more single acting rams.

Circle 115 on Reader Service Card

Hydraulic Components . . . LaPlant-Choate Manufacturing Co., Inc. offers a 16 page folder describing their line of hydraulic products which includes pumps, valves, motors, cylinders and package power units. Complete performance data showing efficiencies, horsepower requirements and flow are plotted for power units. Dimensional drawings assist in the installation of these components. Shop photographs show the manufacturing facilities used in producing these components.

Circle 116 on Reader Service Card

"Engineering Data on "O" Ring Hydraulic Packings" . . . is the title of a six page folder offered by Precision Rubber Products Corporation. Users of "O" rings for static and dynamic seals in hydraulic and pneumatic service will find this brief, complete and accurate installation data very helpful. The folder includes sizes and compounds for all standard "O" rings. A chart indicates for which fluids the various compounds are best suited. Sketches show examples of typical static applications along with rotary, reciprocating and oscillating applications. Charts give complete dimensioning for piston and cylinder sealing.

Circle 117 on Reader Service Card

Hydraulic Boosters . . . The practical advantages and applications for "Dual Pressure" boosters developed since the war and manufactured on a low cost production line basis from standard air and hydraulic cylinder components are highlighted in this informative 4-page editorial reprint titled "Boosters and Their Practical Application" offered by Miller Motor Company. Circuit drawing, illustrations, and a detailed description of typical practical applications are presented.

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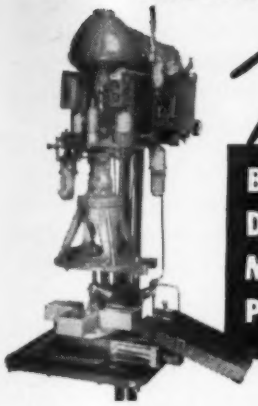
Circle 61 on Reader Service Card



New!

BECKETT AIR POWERED DRILLING AND TAPPING MACHINE *increases* TAPPING PRODUCTION 300%

- With air feed, four 8/32" holes are tapped in die cast parts in 3 seconds—DIRECT FROM MULTIPLE DRILL HEAD! 2400 parts tapped per hour.
- No tapping head, lead screw or clutches used.
- Taps automatically vapor lubricated each cycle.
- Air powered 4-station index table electrically interlocked with tapping cycle.
- Tapped parts automatically air ejected. Operator only loads.

VERY light air pressure permits taps to provide their own lead. There is no forcing of the tap; no galling action. Threads produced are exact duplicates of the tap used. Tapping depth controlled within 0.001". Tap reversal is obtained by split second reversal of motor. Taps lead out without stripping last thread. Cycle speed is infinitely variable. Manual push-button single cycle control speeds job set-up time. Machine converts to automatic drilling by removing taps, inserting drills and actuating a switch. Can drill and tap from same fixtures.

You can triple your small hole drilling and tapping production —at great savings—with the new Beckett Drilling and Tapping Machine. And the investment is LOW! Write today for complete information.

BECKETT-HARCUM CO. 1145 Wayne Rd., Wilmington, O.

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PEMACO HYDRAULIC AND AIR CYLINDERS

with the NEW

Cartridge Type Packing Gland

Designed to J. I. C. Hydraulic Standards

Pemaco Hydraulic Cylinders are soundly engineered—give long life and top performance. The steel ram is hardened to 50.C Rockwell, ground and lapped. NOW the Pemaco has the first self-contained Cartridge Type Packing Gland.

This new Pemaco "EASY-PAK" Gland is designed to comply with J.I.C. Standards. It combines double bearing surface, low friction ram seal, and a ram wiper into a single compact unit. Easily maintained, the Pemaco "EASY-PAK" Cartridge Type Packing Gland can quickly be replaced in most cases without removing the cylinder from the machine — and by inexperienced help — greatly reducing machine down-time.

Pemaco "EASY-PAK" Cartridge Type Packing Glands are manufactured for both hydraulic and air cylinders.

PETCH MANUFACTURING COMPANY

Write for complete information and engineering data.

36100 HARPER AVE. MT. CLEMENS, MICH.

NOPAK

4-WAY VALVE Controls

Model "D" Cylinder and Air Operated Chuck on Sundstrand Lathe

Arrows point to NOPAK Model "D" Air Cylinder which locates workpiece for clamping. NOPAK 4-Way Valve is shown in circle.

In this lathe application, a ¼" NOPAK 4-Way Valve performs two vital functions. (1) It controls the NOPAK Model "D" Cylinder which locates the workpiece before clamping, and (2) it operates the air chuck. When the valve is open, the chuck is unclamped and the "locater" is down; when the valve is closed, the chuck is clamped and the "locater" is up.

This application of a NOPAK Valve and Cylinder is typical of many in the machine-tool field. It may suggest how you can use NOPAK products to improve the performance of machines or equipment you use in your plant, or build for others.

NOPAK ¼" 4-Way Hand Valve controls both air chuck and NOPAK Model "D" Air Cylinder.

GALLAND-HENNING MFG. CO.
2743 S. 31st Street, Milwaukee 46, Wis.

Write for Bulletin SW-1 or refer to Sweet's File for Product Designers.

Representatives in Principal Cities

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE
A 5938-½H-A

POST SCRIPTS OF INDUSTRY

NEWS · VIEWS · TRENDS

W. E. Bosselman

W. E. Bosselman, field engineer of the **Gibson Engineering Company**, has been transferred to: Gibson Engineering Company 119 Ann Street, Hartford 3, Connecticut. Mr. Bosselman will replace F. J. Clancy, who has resigned because of ill health.

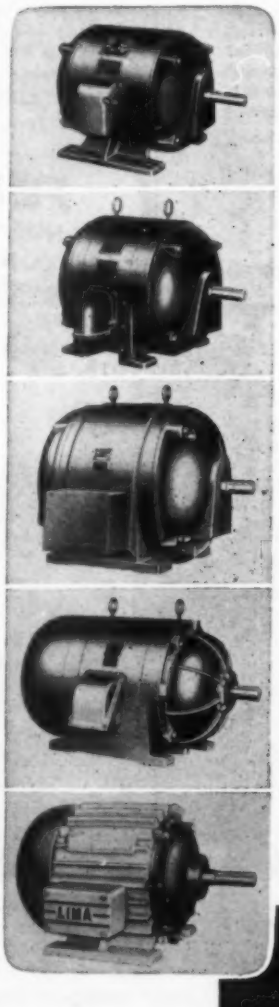
Mechanical Air Controls, Inc. announce their new location at 15311 West Eleven Mile Road, Royal Oak, Michigan.

Greer Hydraulics, Inc. announces the appointment of the **J. M. Grimstad Company** as sales and service representatives for the Minnesota and Northwestern Wisconsin area. **Robert Hazelrigg**, with headquarters at the Minneapolis office located at 2509 30th Avenue South, will be in charge of sales and service of Greer Products.

Ludwig A. Majneri, former Warner Aircraft Corporation vice president and chief engineer, has formed **Aeroguild, Inc.**, to engage in the field of hydraulics and make precision products and parts. The new company will carry on hydraulic developments which Majneri has engaged in since his resignation from Warner two years ago. Majneri, who has served in this field since 1923, is president and chief engineer. The company is located at 11639 Klinger Ave., Detroit 12, Michigan.

Electrol Incorporated, Kingston, New York, announces the appointment of **Morgan D. Ryan** as personnel manager and security officer. Until recently Mr. Ryan served as a counselor with the Veterans Administration.

Two promotions in the inside sales force at of **Standard Pressed Steel Co.**, Jenkintown, Pa. have been announced by J. Whiting Friel, vice president in charge of sales. **C. W. Hollingsworth**, former manager, Unbrako Socket Screw Division, becomes divisional sales manager. **Raymond W. Gruber** succeeds **Mr. Hollingsworth** as manager, Unbrako Division.



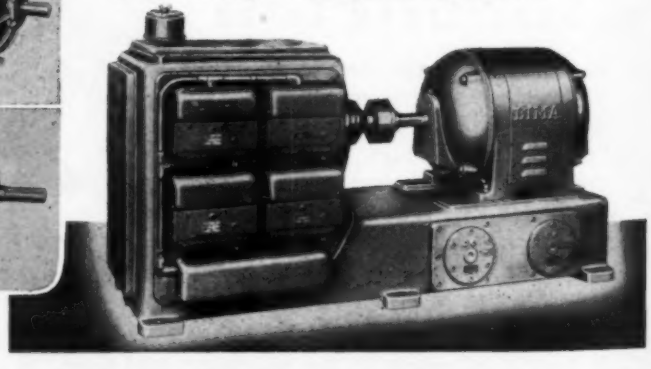
LIMA MOTORS have *built-in* DEPENDABILITY

● Ruggedly built for "tough" industrial applications, LIMA MOTORS are piling up records of outstanding dependability in progressive industrial plants throughout the world.

Original equipment manufacturers, quick to observe the performance of these motors, are specifying LIMA for their products.

Prompt deliveries on ratings of 1/3 to 150 HP, with Dripproof or Totally Enclosed frame construction.

Photo below shows a LIMA Dripproof Motor, direct-coupled to a BARNES L Type Hydraulic Unit—an original equipment application.



LIMA ELECTRIC MOTORS

WRITE TODAY FOR BULLETIN MB-1

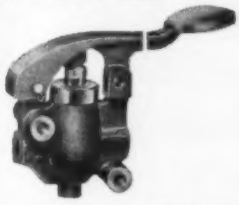
Representation in principal cities

THE LIMA ELECTRIC MOTOR COMPANY

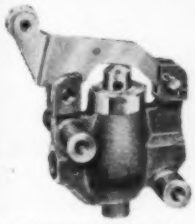
2726 FINDLAY ROAD • LIMA, OHIO

Schrader Valves—Practical answers to air control problems

To meet the vast and increasing variety of applications for air cylinders and other air line accessories, Schrader supplies a comprehensive range of equally useful control and operating valves for operation by hand, foot or cam. Shown below are just a few from Schrader's more than a hundred models.

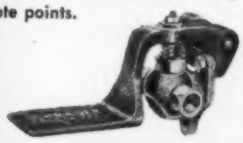


Hand Lever—This is one of the many Schrader hand operated valves. Brass body with stainless steel parts. Can be mounted rigidly at any angle. Specially constructed lever makes operation easy and



Valves with roller lever—These valves are designed for any cam actuation. The free turning roller riding on a cam provides long life by reducing friction.

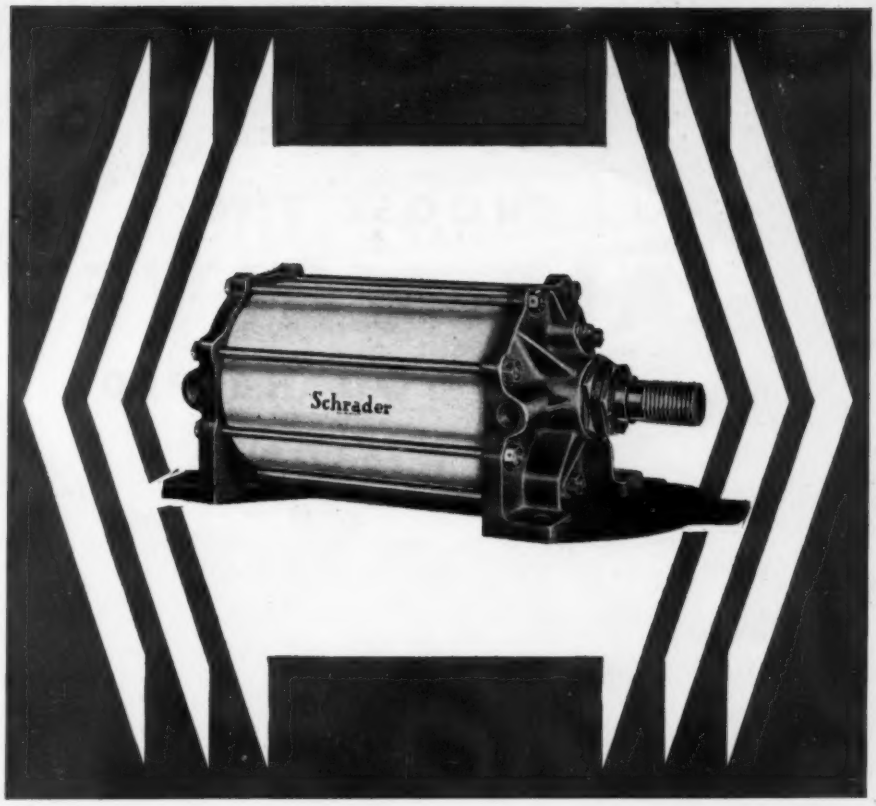
Pilot valves—Both two and three way, with or without timer. Normally open or normally closed. Provides instant power at remote points.



Foot Lever—This valve supplies line pressure to single acting cylinders. It is functionally designed for "tip-toe" operation.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Schrader
PRODUCTS
CONTROL THE AIR



Four ways that air cylinders can increase production in your plant

You can make hard work easy, eliminate manual effort and speed up production by the application of air power . . . often the best, usually the economical way to apply force where you need it. For example:

- ***To provide a powerful push***
- ***Where clamping is necessary***
- ***For lifting operations***
- ***To power a reciprocating motion***

Schrader Air Cylinders are increasing production through safer, faster and less fatiguing operations, in many thousands of applications in plants throughout the country.

Undoubtedly there are many places in your own plant where Schrader Air Cylinders will be just the thing. Ask us to help you determine what will best fit your needs. Send us a letter outlining your particular requirements, your idea, or fill out the coupon below.

Mail This Coupon Today

A. Schrader's Son
Division of Scovill Manufacturing Company, Incorporated
456 Vanderbilt Avenue, Brooklyn, N. Y., Dept. B-3

Please send me further information on the Schrader ClampAir and valves.

Name_____ Title_____

Company_____

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City_____ Zone____ State_____

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CHOOSE THE

AIR VALVE

YOU HELPED DESIGN

Best for Trigger-Quick Control of all Air Operated Equipment

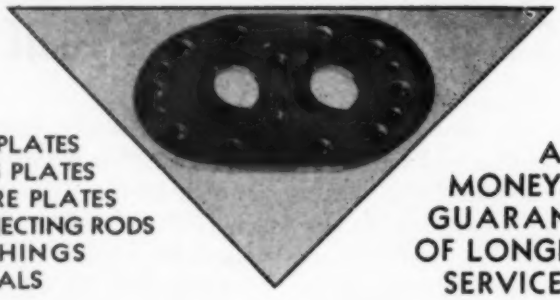
FULL FLOW
·
COMPACT
·
ONE MOVING PART

TWO BASIC
PIPE SIZES: ⅛" - ¾"

MECHANICAL AIR CONTROLS

MAC

Send for FREE Catalog today • 15311 W. 11 MILE ROAD, ROYAL OAK, MICHIGAN



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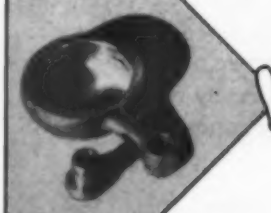
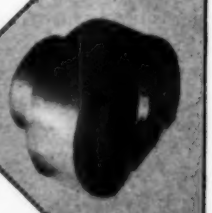
BEARING PLATES
PRESSURE PLATES
CONNECTING RODS
BUSHINGS
SEALS

A MONEY-BACK GUARANTEE OF LONGER SERVICE



PROMET
THE Engineered BRONZE



Machined or rough cast and of the specific formula best suited to the application.

Send blueprints, conditions of operation and other data for recommendations and quotations.

Write for literature today.
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AMERICAN
CRUCIBLE PRODUCTS
COMPANY
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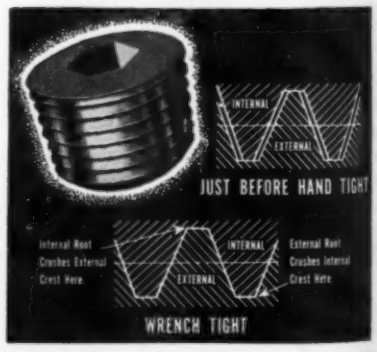
UNBRAKO®

DRYSEAL

THREAD

PRESSURE PLUG



SEALS TIGHT
WITHOUT COMPOUND

Unique thread design of UNBRAKO "DRYSEAL" Pressure Plugs provides positive sealing at both major and minor diameters of threads, preventing spiral leakage, even under extreme pressures. Full range of sizes from 1/16" to 1¼" N.P.T.F.

Write for Bulletin 675.

–SPS–

STANDARD PRESSED STEEL CO.
JENKINTOWN 2, PENNSYLVANIA

Circle 68 on Reader Service Card

The formation of **Devicengineering,** a new manufacturer's agency, in Philadelphia is announced by **William A. Diament,** former vice president and sales manager of Fischer & Porter Co. They represent manufacturers devoted largely to the manufacture of custom electrical, hydraulic, and instrument devices.

Shields Rubber Company, Chicago, has been appointed distributor for "O" rings manufactured by **The Parker Appliance Company.**

Snap-Tite, Inc. has moved to 201 Titansville Road, Union City, Pa.

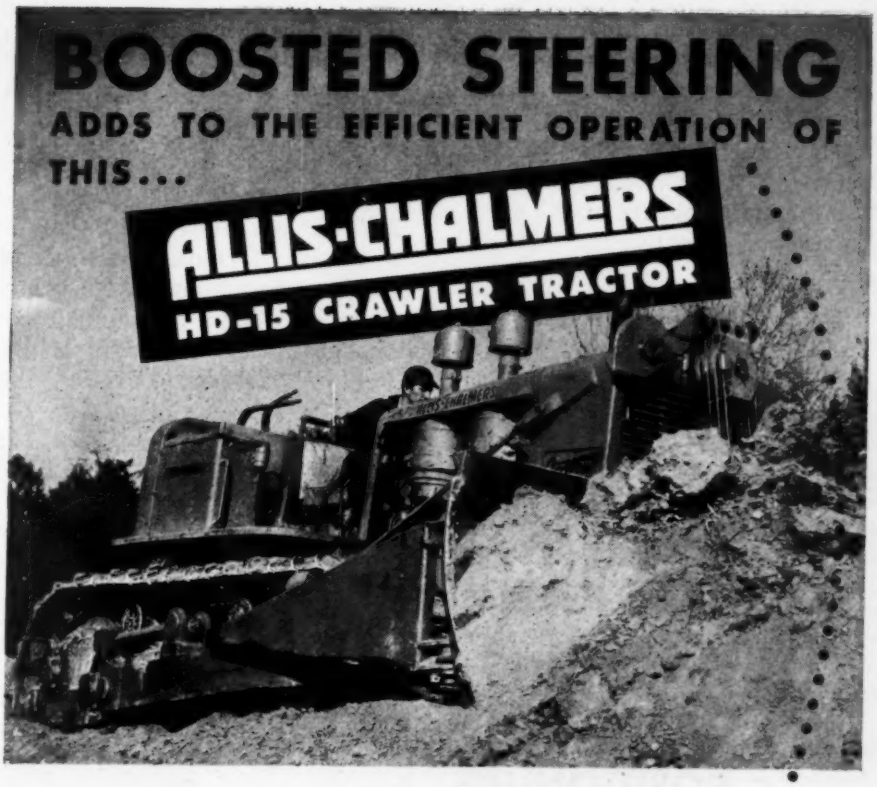
Raymond B. Jewett has been appointed industrial sales engineer of **The Parker Appliance Company,** Cleveland, to represent the company in Philadelphia, serving the eastern Pennsylvania, New Jersey, Delaware, Maryland, and Virginia area.

Goodyear Supply Company, Philadelphia, has been appointed distributor for precision aircraft and industrial "O" rings manufactured by **The Parker Appliance Company,** Cleveland, it is announced by D. W. Holmes, Parker vice president in charge of sales.

Schutte and Koerting Company have moved their offices and plant to Cornwells Heights, Bucks County, Pa.

Ward Leonard Electric Co. announce the appointment of **Maury E. Bettis Co.,** 3319 Gillham Road, Kansas City, 3, Mo. as their industrial and electronic sales representative for the Kansas City area.

W. P. L'Hommedieu has been appointed assistant Pacific Coast district manager for the **Westinghouse Electric Corporation** with headquarters at San Francisco.



SPECIAL **ROPER PUMP** POWERS
HYDRAULIC BOOSTER FOR STEERING

This Allis-Chalmers HD-15 crawler tractor, which develops 102 h.p. at the drawbar, is one of four in the line that now sets a new standard in tractor classification. Among the components that keep this 27,500 pound bruiser going is a special Roper Pump — the power hydraulic booster control for steering. Engineered to withstand the most gruelling operating conditions, this pump has more than proved its worth in years of service in the HD-19. Now Allis-Chalmers is providing the same steering performance in the new HD-15. Yes, Allis-Chalmers knows full well Roper dependability.

INVESTIGATE THE ROPER LINE OF STANDARD PUMPS

Roper "Standard" Pumps — Series 3600, F, K, and H — also figure prominently as original equipment in diversified installations. These Ropers provide a wide selection: sizes 1 to 300 g.p.m.; pressures to 1000 p.s.i., and come standard or special fitted depending on the liquid to be pumped. *Send for the Roper catalog and get complete details.*

ROPER
Rotary Pumps

SEE OUR CATALOG IN SWEET'S

GEO. D. ROPER CORP.
706 Blackhawk Park Ave.
ROCKFORD, ILLINOIS

Circle 69 on Reader Service Card

Air Associates Incorporated has expanded its manufacturing facilities by leasing additional plant capacity at Orange, New Jersey. The newly acquired plant will be used for the manufacture of the corporation's electronic equipment.

J. S. (Steve) Thurlow, a member of the firm of **Hathaway-Thurlow Company**, 706 Jones Building, Seattle 1, Washington, announces the addition of the line of **Ajax Flexible Couplings.**

Appointment of **G. E. Campbell** as assistant works manager and of **Donald A. Sutherland** as industrial sales manager has been announced by R. J. Minshall, president of the **Pesco Products Division of Borg-Warner Corp.** Mr. Campbell formerly was manufacturing consultant in the central offices of Borg-Warner in Chicago, and Mr. Sutherland previously was Pesco's industrial relations manager, a position which he assumed after having served as the division's eastern sales manager for industrial products. **E. J. Foltz,** previously Mr. Sutherland's assistant, has been promoted to the post of industrial relations manager.

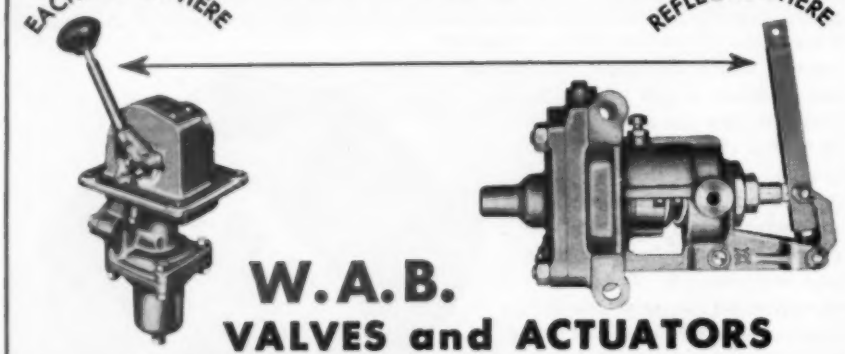
Gene T. Neudeck has been appointed general sales manager of the **V. L. Graf Company,** Romeo, Michigan. Mr. Neudeck was previously sales engineer with Aeroproducts Division of General Motors in Dayton, with whom he had been associated for ten years. A registered professional engineer, Mr. Neudeck received his degree in aeronautical engineering from the University of Michigan in 1941.

G. T. Neudeck

Got any Problems That Call for

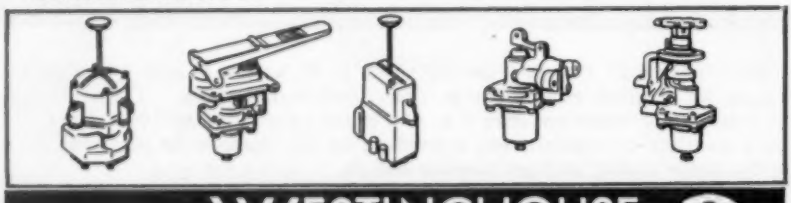
THROTTLING
GRADUATING } **CONTROLS?**
POSITIONING

Here's your Answer...



W.A.B.
VALVES and ACTUATORS

The smallest move of the control-valve handle is "echoed" by proportional movement of the actuator to throttle engines, graduate flow in process operations, positioning actuator to modulate fuel feed to boilers, etc. Eliminates complication and maintenance of mechanical linkage. Only connection is an air tube. Place controls at any distance from operation, centralize command of multiple operations. Hand, foot and cam operated valves available. Ask for Bulletin IDA 9481-1.



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Classified Advertising

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Hydraulic Technician (Supervisor)—Experienced in supervision of assembly, service, test and experimental work on hydraulic components and assemblies, desires position in or near New York City. Box 6251 Applied Hydraulics.

Circle 71 on Reader Service Card

The Higher the Pressure ...the Tighter the Valve

On hydraulic presses of all types this Yarway Hydraulic Valve will give long life with minimum maintenance. Automatically regrinds its own sealing surfaces. Small and compact. Easy to install and operate.

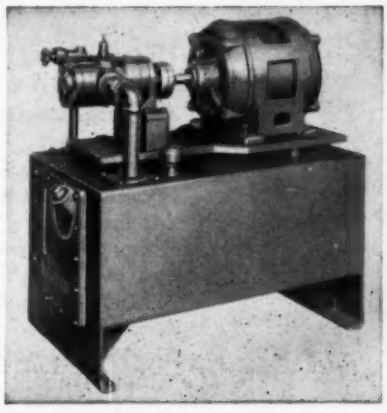
Yarway Single-Pressure Hydraulic Valves are made in straightway, three-way and four-way types; in five sizes for pressures up to 5000 lbs. Also Yarway Two-Pressure Valves in two sizes for pressures up to 5000 lbs. Write for Bulletin H-210.

YARNALL-WARING CO.
155 Mermaid Ave., Philadelphia 18, Pa.

YARWAY
Improved Type
HYDRAULIC VALVE

Circle 72 on Reader Service Card

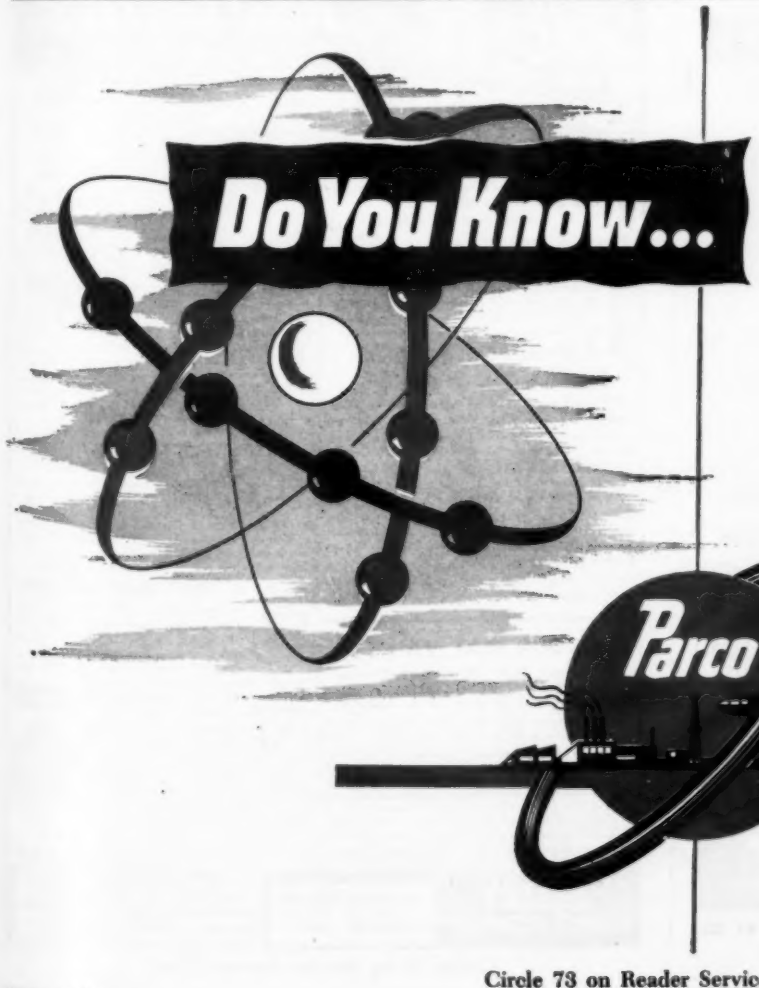
NEW HYDRAULIC POWER UNITS conform with J.I.C. Standards



Vickers Incorporated announces new Hydraulic Power Units constructed in complete accordance with the Joint Industry Conference Hydraulics Standards for Industrial Equipment. Features include: completely sealed tank with breather air cleaner and separate filler hole having removable mesh screen and chain-attached cap; flush type oil level indicator with high and low oil positions marked. Elevated tank and separate mounting plate add to installation convenience and also allow radiation from all tank surfaces. Dished tank bottom and drain plug permit draining without spillage and cleanout holes at each end provide for complete cleaning of tank.

The new units are available in three series (T20, T30 and T60) and 10 models for electric motors from ¾ to 25 hp. Vickers single, double and two-pressure pumps are used for 1000 psi service, Vickers two-stage pumps for 2000 psi service.

For complete information, write to **Vickers Incorporated,** 1474 Oakman Blvd., Detroit 32, Mich., asking for Supplementary Sheet 12a, Catalog 5000. Adv. 4534



That in addition to natural rubber, there are six basic synthetic elastomers from which Parco "O" rings are manufactured? When properly compounded and processed, the most desirable inherent properties of each can be brought out, making them suitable for most applications requiring a simple, economical, and efficient sealing mechanism. Because of their years of experience, Parco engineers are best qualified to recommend and tailor Parco balanced compounds for your needs. Consult them!

All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-P-5510 (6290) are available from stock.
"O" ring packings to your specification are available on order.

Plastic and Rubber Products Company

2100 Hyde Park Boulevard, Los Angeles 47, California
820 North State Street, Chicago 10, Illinois

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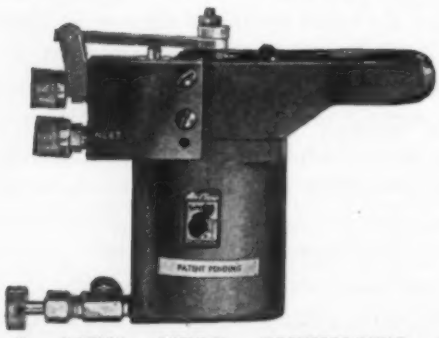

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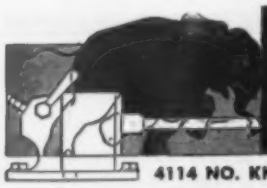
This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines —increases production substantially on suitable jobs: double or more in some cases.

Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and break-through cushion. Quick return. Easy to synchronize with automatic cycle equipment.

Air-Power does it quicker, cleaner, better.
Write today for latest complete catalog.



MEAD
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SPECIAL BARGAIN
#29 HYDRAULIC CYLINDER

Gives 20,000 lbs. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lbs. thrust with 3,000 lbs. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1¾" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road farm and shop machinery, presses, etc. Cost Government $390.00 NOW 37.50

HYDRAULIC CYLINDERS

NO. 3A – Bore 1½", Shaft ½" Stroke 5", Length 10½" 5.75
NO. 9E – Bore 1-3/8", Shaft 1" Stroke 15-5/8", Length 15¾" 8.50
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AN-Hi-Press. HOSE (FUEL – OIL & AIR)

1/4" Tube Size – 7/16 x 20 Thread – 16" long with Male and Female fitting at either end. . .95¢ each.
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3/8" Tube Size – 9/16 x 18 Thread – 20" long with Female fitting at both ends. . . . . $1.90 each
Same as above but 63" long. . . . . $3.75 each
1/2" Tube Size – 3/4 x 16 Thread – 24" long with Female fittings at both ends. . . . . $2.65 each.
Same as above but 67" long. . . . . $3.75 each.
5/8" Tube Size – 7/8 x 14 Thread – 15" long with Female fittings at both ends. . . . . $2.25 each.
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FOUR WAY VALVE

V-28 – Poppet Type. Off at neutral position. 3/8" AC Tube Ports – (9/16 - 20) thread. P.S.I. 1,500 . . . . . 4.75
V-17 – Poppet Type. Pressure balanced. Offset neutral position. Piston type with built-in relief valves for limit of cylinder strokes. ½" Standard pipe inlet & outlet ports. ½" AC tube to cylinder (⅝" - 18) thread tapped ports. NEW 8.75

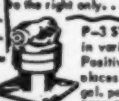
We carry the World's Largest Supply of New Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes & Types. Can also supply all accessories such as Pumps, Fittings, Valves, Tanks, Hose Fittings. Let us solve your Hydraulic problems. Write for inform.

HYDRAULIC TRANSMISSION

Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever.) supplying piston hydraulic motor. Automatic pressure, Dash pot for smooth control. Power output R.P.M. – 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. Includes 2 - 4" Spline Shafts for input and power take-off. Cost Government approx. $400.00 37.50

HYDRAULIC PUMPS

ANGLE PUMP
Positive displacement type, angle piston. Displaces .507 cu.in. per revolution. Has capacity of 6 gal. per minute at 3000 RPM at 1500 PSI continuous 1875 for 15 seconds. Operating speed of 3750 RPM, intermittent maximum 4500 RPM. Rotates to the right only. . . . . NEW 17.50



P-3 STRATO POWER PUMP With built-in variable flow control valve in head. Positive displacement piston type. Displaces .450 cu. in. per revolution. Two gal. per minute capacity at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous. 1400 PSI for 15 seconds. Operates at 3750 RPM, intermittent maximum 4500 RPM. Rotation either direction without adjustments. NEW 17.50

GEROTOR TYPE PUMP

Logan Gerotor type. For operating hyd. systems on tractors, trucks industrial machinery, etc. Delivers 8 GPM, at 1200 RPM, at 1000 PSI with 5 HP. Can also be used as Hydraulic Fluid Motor. Has 3/8" stnd. pipe ports, ½" splined shaft for pulley or direct attachment. 5½" dia. x 7" lg. Used but guaranteed condition. Now ONLY 22.50

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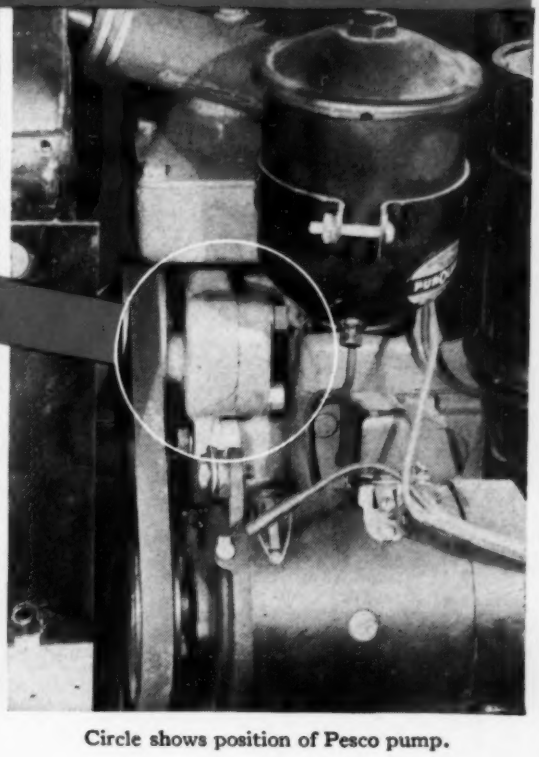
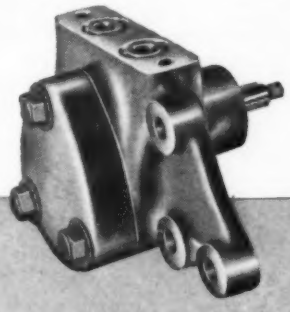
Circle 75 on Reader Service Card

Another Job for Pesco HYDRAULIC MUSCLES

"The sensitive response of the hydraulic system permits such trigger-fine adjustment that operators are loud in their appreciation," says Massey-Harris . . . *the sales power of hydraulic power in action.*



Circle shows position of Pesco pump.



Pesco pump designed for Massey-Harris Pony tractor. Capacity: 2.5 g. p. m. @ 2880 r. p. m. @ 1000 p. s. i.

Pesco *Dual Purpose* Pump Eliminates Extra Power Shaft on Massey-Harris Pony

The problem was to eliminate all unnecessary weight and cost and save space on a small tractor.

So Massey-Harris tractor engineers and Pesco hydraulic engineers teamed up . . . together came up with a specially designed dual purpose hydraulic pump to serve as both pump and fan bearing mounting.

Result: less space and weight required . . . necessity for an extra motor power shaft is eliminated.

Such teamwork between Pesco and client engineers is frequent. Matching hydraulic know-how and skills with the engineering knowledge of a manufacturer's engineering staff is the way we at Pesco like to work. It is teamwork that puts the sales power of hydraulic power to work to full advantage for our customers.

If you have a problem in hydraulics Pesco engineers will gladly co-operate with your engineers to solve it. Write today.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

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Circle 2 on Reader Service Card

Guard Your Family STRIKE BACK!

GIVE to Conquer Cancer

IF SOMEONE IN YOUR FAMILY HAD CANCER, you would do anything . . . everything that would help. And today there is so much that you can do to help. Tens of thousands of families just like yours meet cancer every year and triumph over it. But we are still losing too many men and women we love.

Doctors can now cure half of those who develop cancer if the disease is diagnosed in its early stages. Yet in 1950 some 210,000 families lost a father, a mother or a child to cancer. Many of them—probably 70,000—could have been cured.

To save more lives, we all must help.

Your gift to the Cancer Crusade will help guard your family by providing more research, more life-saving education, more training for scientists and physicians, more equipment, more services for those already striken with the disease.

Cancer is man's worst enemy. Striking back at cancer costs money. Any contribution is welcome but, the fight against this major threat deserves major support: dollars—tens—twenties —hundreds of dollars. Will *you* help?

AMERICAN CANCER SOCIETY

Applied Hydraulics